NEWS IN PERSPECTIVE

JUNE 15, 1961

ECONOMIC CLIMATE

CONTINUING GROWTH in the economy is assured, but it will not strain productive capacity to meet demand. The outlook is for a fairly steady rise in the total value of goods and services. From the 1960 year-end level of about $500-billion, there may be progress to almost $530-billion. Since most of this rise will be concentrated during the second half of the year, it will seem more rapid than if it had been spread more evenly over the 12 months.

UNEMPLOYMENT PROBLEM will remain vexatious even if the $530-billion level in gross national product is achieved--and there is more than a possibility that it will not be reached. Some rather conservative judges in both government and business say it is safer and more realistic to think in terms of a year-end figure closer to $520-billion. This would yield a year-end figure of $509-$510-billion. A near-miss of the higher figure, the best expected, would still leave unemployment at a rate of 6-percent or so. And it has been made very clear by the Administration that a tiny drop in the unemployment rate will not bring about retrenchment in its ambitious public spending plans.

FEDERAL DEFICIT as the fiscal year ends appears larger than had been officially anticipated. Tax receipts, despite business recovery, have not been as high as projected. Furthermore, farm programs and military needs have cost more than was expected. Next year, a significantly larger short fall in revenues--perhaps as much as $5-billion--is not unlikely even if business continues to expand.

MANAGEMENT VIEW

MUNICIPAL OWNERSHIP PROBLEM--"By and large, the electrical industry has learned how to handle it," observed Central Survey's Pres. Wm. J. Longman in a recent presentation for the PUAA. "In the past five years, actual gains by municipal ownership have been almost negligible." He adds: "Sooner or later, many people have become disillusioned with municipal ownership." Reasons behind the sale of numerous municipal systems to electric companies: (1) systems being too small to operate economically, (2) getting too tied up in political operation, (3) failure of management to provide for the financial future of municipal systems, (4) poor financial condition of cities, along with need to provide capital for improving other community facilities, and (5) service problems inherent in an isolated local system.

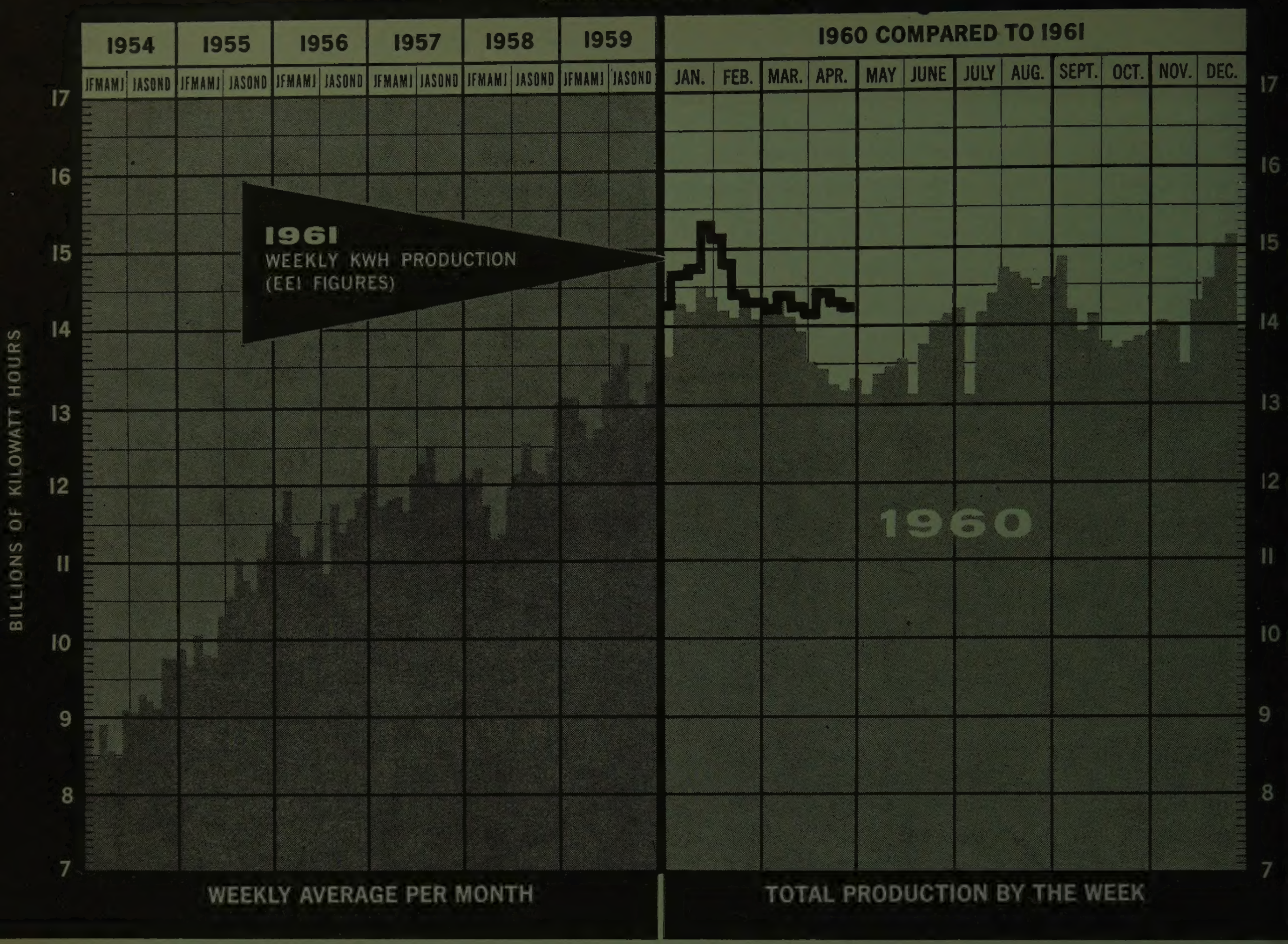
REACTION TO ESTIMATED BILLS is a problem involving only a "minute segment" of the customers whose kwh consumption must be so handled in order to maintain schedules, says the chairman of the EEI project committee which has studied this area of customer relations. Long Island Lighting's O. V. Jones comments that this reaction is not out of proportion with the problems created by special readings and special billings. Looking to the future for a solution, he views favorably the prospect of utilizing telephonic recording devices, possibly for all meters on utility systems.

UTILITY PURCHASING-SALES interchange of information is stressed by H. F. Staacke, V-P of Houston Lighting & Power Co. Addressing the recent annual meeting of the EEI Purchasing and Stores committee, Mr. Staacke urged that P&S keep Sales advised of large purchases which might be clues to new industrial load... and, in turn, that Sales inform P&S of large orders received, customer expansion plans and modifications to help keep ahead of the utility's own supply needs.

FUTURE POWER SUPPLY FOR CO-OPS in northern Minnesota should come from a new REA-financed generating plant operated (beginning in 1967) as part of the Minnesota P.&L. Co. system, the utility's Pres. Clay C. Boswell proposes. In an annual report to stockholders, he disclosed that the co-ops are considering obtaining their future power supply from "super-cooperatives" in the Dakotas, whose plants would be part of the Eastern Missouri Basin system involving extensive Federal facilities. Mr. Boswell promised "competitive power, more dependable flow."

Electric Utility Barometer

(Source: Edison Electric Institute)



NEWS IN PERSPECTIVE

WASHINGTON INFLUENCE

FUELS AND ENERGY STUDY, proposed by a Senate Resolution, has received the blessing of the Interior Department. Secretary Udall said that a study "which gives full weight to considerations of national defense, the needs of our domestic economy and considerations of international trade and international diplomacy, would assist both the Congress and the Administration in developing future policies and programs." Assistant Secretary Holum said in a letter to Sen. Anderson, chairman of the Senate Interior Committee, that Interior "is anxious to co-operate actively with the Senate in the preparation of the study and stands ready to make available a wealth of information bearing upon this problem now in the Department."

HANFORD CONVERSION is at odds with depressed area legislation, says Rep. Van Zandt (D., Pa.). He noted that spending $95 million of "sorely needed" Federal funds "would be used to lure industrial enterprises away from other sections of the country that are desperately in need of additional employment opportunity." Moreover, he noted that some of the power companies in the Pacific Northwest are planning their own steam generating units. "For this reason, it might be said that adding these electric generating facilities to Hanford would further postpone the use of coal-fired stations to firm up much of the Pacific Northwest's nonfirm hydropower."

IRRIGATION WATER OUTLOOK for 1961 is tight, but "holdover storage in reservoirs will carry most projects through the coming irrigation season."

Even with farmers conserving water, "some shortages will probably occur."

FEDERAL HELP TO STATES in their water resources planning activities has been proposed by Sen. Kerr (D., Okla.). The bill would set up a Federal Water Resources Planning Board and authorize $5-million a year for 10 years to help States cover a portion of the costs.

SEC ADVICE TO UTILITIES is not to aim at reducing tax payments by loading themselves with debt. SEC's chief financial analyst noted that utilities have tended to get new money by debt, rather than equity, financing. The agency's rule-of-thumb for the capital structure of a utility is for a maximum of 60% long-term debt and at least 30% in common stock. Utilities, said SEC, should consider income taxes, but "the tax reductions resulting from the deductibility of interest on debt should not be accorded overriding weight at the expense of a sound and simple capital structure." SEC warned that if times get bad, this deductibility "may be of little comfort to either investors or consumers."

STEAM PLANT, planned by Duke Power Co. for the Savannah River, Ga., is described by Sen. Thurmond (D., S.C.) as "proof of the fundamental ability of the private segment of our economy to meet the demands of a highly complex and industrial society with eficiency and competence." The plant, to cost $280-million, will mean employment of 1,000 people, ultimate generating capacity of 2-million kw, and annual cost consumption of 3½-million tons. In asking for authorization from Congress, Sen. Thurmond said his bill "actually constitutes the type of area redevelopment bill which is best designed to remedy defects in our economy and unemployment."

CRITICISM OF THE NEW FRONTIER has been made by NRECA head, Clyde Ellis. The Administration, he maintained, needs prodding in the race to develop giant electrical power facilities to compete with the Soviet Union. Although Ellis conceded that the government is "making great strides in other areas in which we are interested," he has found "no evidence yet of the bold new forward thrust we had been promised."

HUGE POWER GRID to "interconnect the capacities of our country, Canada, Mexico and the rest of America" has been proposed by NRECA's Clyde Ellis. This inter-American power pool, he said, "would trigger the biggest boom" in our lifetime.

POWER PROGRAM espoused by the late Sen. George W. Norris--which envisages co-existence of co-ops, private and public power--typifies "the political pluralism he believed in, and which the present Administration, too, desires," according to Interior Secretary Stewart Udall.

REA EXPANSION into rural redevelopment is under way. REA is setting up a separate organization to concentrate on such problems; it has been delegated new loan-making authority under the Area Redevelopment Act, and will, if all goes well, "be in a position to make direct loans for industrial and commercial projects" in depressed areas. Electric co-ops will be encouraged to invest in developmental co-ops. Section 5 of the REA Act will be used to finance projects of all types, including industrial and commercial.

UTILITY COOPERATION in nuclear R&D in their mutual interest has been suggested by AEC to the East Central Nuclear Group and the Florida West Coast Nuclear Group. Because of technical and economic uncertainties, AEC has terminated its cooperative project with the companies for a Florida nuclear power project. But the Commission wants the companies to continue to explore natural uranium reactor systems. (See p. 54.)

PERMITTING MORTGAGES and other liens upon nuclear reactors and other facilities is under consideration by AEC. The Commission would also provide for enforcement of creditors' right, transfer of reactor licenses, and surrender and termination of such licenses. So far, AEC has consented to mortgages on Yankee Atomic Electric Co. and Commonwealth Edison. General approval is now proposed, with creditors provided the same license requirements made of the licensee apply to them and provided they do not foreclose without AEC permission.

PUBLIC PARTICIPATION in safety review of all demonstration power reactors has been provided by AEC.

FIRST STEP in all-federal transmission grid in California has been made by Interior Department. A Reclamation contract for engineering services will plan for lines to carry power generated by Trinity River Division's hydro plants to Tracy.

INDUSTRY SIFTINGS

"CONSUMER EDUCATION PROBLEMS" demanding a show of renewed enthusiasm in the electric heating market, according to GE's John St. Lawrence, are service reliability and cost. He noted in a recent talk for the Rocky Mt. Elect. League that a survey by National Family Opinion, Inc. indicates that reliability and service requirements of electric heating are questioned by most families (as they are nationally), and that the cost is questioned by an even higher percent than in the national survey.

RISING DISTRIBUTION COSTS can be traced to actions by manufacturers, like these: (1) increasing proliferation of models with a line, (2) accelerated rate of introduction of entirely new products, (3) multiple franchising, (4) inefficient packaging, (5) confusing sales terms and conditions. Speaking to the NAED convention, R. H. Jones, general mgr. of the GE Supply Co., Bridgeport, Conn., conceded that "perhaps all partners in our industry have a responsibility for these so-called high costs of distribution... and it's never easy to prove who's responsible for spending too much of the consumer's dollar."

ELECTRIC HEATING BUSINESS--Distributors are concerned about losing their desired role in it by default, particularly to the furnace dealer. An NAED committee, reporting to the Association's recent convention, acknowledged that it is "impossible for us to build a fence around this business and claim it for our own." The alternative: by having "a full-rounded program and a working plan, make it pretty tough for competition to edge in on us."

PROTECTION FOR SERVICE AREAS of utilities in Oregon received new legal backing last month when the state adopted legislation authorizing issuance of certificates by the PUC to establish claims of existing service agencies.

HIGHER RATES IN HOUSTON, requested by Houston L.&P. Co., were protested in hearings last month by city councilmen who argued that the utility's net income was rising. The company had deducted $1.7-million from 1960 income to allow for abnormal electricity use in "a hotter year than usual"; but, critics pointed out, nothing was added to represent increased consumption by industrial customers.

IDENTICAL BIDS NOT ILLEGAL--This viewpoint was expressed for the Senate anti-trust and monopoly subcommittee by Pres. Mark Cresap of Westinghouse. He called such bids "natural" on standard products, priced in catalogs of the competing suppliers. (TVA received more bids of this kind only a few weeks ago, but a "price adjustment" clause set apart one GE bid on power capacitor units and Line Material underbid by 14-percent three U. S. competitors for supply of 46,000 insulators).

SIMPLE, FUNCTIONAL MACHINES are needed by the wire and cable industry to help offset a market situation where profits have dropped to one-percent of sales and competition among 200 domestic companies has kept prices at the same level or below those of recent years. Anaconda's F. B. Krafft advises machine manufacturers: "Avoid complex electronic innovations that mean problems for our maintenance departments."

RISING COPPER PRICES last month were half-way back to the 33-cent level from which they fell last October, starting back up from 29-cents on May 1.

NATION'S TREE FARM SYSTEM now covers over 55-million acres, according to American Forest Products Industries. What they don't produce: outsize poles for electric power transmission (which are regularly in short supply), because growers cannot permit that long a life span for trees on the farm.

MANAGEMENT-MARKETING

"Partnership" Idea Fades . . .

"Public-Private" Duels Flare on Many Fronts

In matters that brought "private" and "public" power interests into direct competition in recent weeks, there have been noteworthy "achievements" on both sides. In far greater profusion, there have been expressions of "opinions" arguing — sometimes vociferously, sometimes eloquently for the causes represented. Local significance cannot be discounted in any of the situations, and industrywide consequences might, of course, be expected from at least some.

Investor-owned interests could point with satisfaction, for example, to "victories" in Marshalltown, Iowa, and Erie, Colorado. Public power was proud of an event which occurred in Sacramento, California.

In the Iowa community, where a new section (served by Iowa Elect. L. & P. Co.) was recently annexed, voters rejected (2248 to 1678) a proposal to give a limited franchise for electrical service to the Marshall County Rural Electric Co-op, even though the co-op offered to pay two percent of gross revenue in lieu of property taxes. In Erie, Colo., voters gave an overwhelming approval (seven to one) to the sale of its 60-year old municipal electric distribution system to P. S. Co. of Colorado, which on the strength of a 25-year franchise expects to re-engineer and rebuild the system.

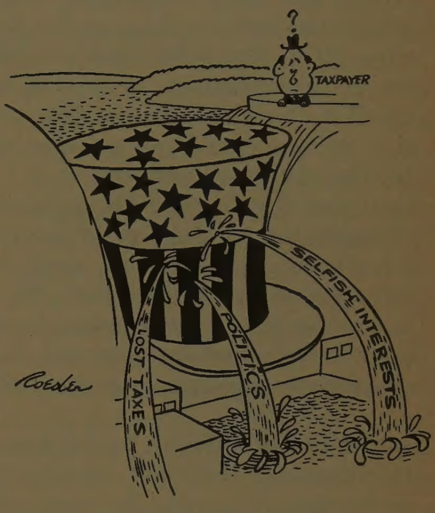
In California, on the other hand, the Sacramento Public Utility District became a generator of some of its own power for the first time. When first power (first 66,500-kw of over a quarter of a million for which the project is designed) was generated at SMUD's Upper American River Project, the District's vice-president declared that the Utility District and its customer-owners have now entered into a new electrical era.

V-P Donald E. Wachhorst observed: "SMUD now becomes a generator of some of its own power, after being strictly a distributor of electricity for the past 14 years. This event marks the realization of engineering studies dating back a generation and manifestation of millions in investment during the past four years."

But, where the California Utility District realized its goal with little or no recorded opposition, it was another matter in the state of Washington. There a PUD group was accused of being "only interested in public power ownership . . . without caring about harm to the region . . . and with no regard for the fact that the project (Nez Perce on the Snake River) is not actually needed to serve their own customers."

The accuser: Pacific Northwest Power Company's Chairman Kinsey M. Robinson, who charged that the Washington Public Power Supply System "attempts to monopolize the region's water resources," warning that the four utilities that organized PNP "would not surrender the right of their customers to be served with a fair share of the northwest's hydro-electric power."

Mr. Robinson's statement was prompted by the WPPSS announcement that its application for the Snake River project would include the High Mountain Sheep Dam (sought by PNP) in its application for the Nez Perce project. About the move, Mr. Robinson commented further: "This move is a clear admission . . . that WPPSS knows that the Nez Perce dam is inferior to the Mt. Sheep. WPPSS does not want us to build the highest and most powerful storage dam in the northwest, because it would destroy the image they have tried to create that private power can build only small dams." (See "Washington Outlook," EL&P, June 1, Pg. 32)



Too Much for Any Spillway?

Meanwhile, in these early months of the new Administration in Washington, the announced (or anticipated) role of the Federal government in the electric power field drew many a new vocal outcry. Example: The plan of the Bureau of Reclamation and the Dept. of the Interior to seek appropriations from Congress to build an all-Federal transmission grid (including new transmission lines from Glen Canyon dam to the Phoenix area) to serve a four state area with Colorado river hydro power, charges Arizona P. S. Co.'s Pres. Walter T. Lucking, would not only lose millions of dollars in tax revenues for the states involved and increase taxes for the nation's taxpayers by many millions. He fears also that "the spirit of cooperation" (between private industry, and public power groups and governmental agencies) could be broken by the Federal government. Mr. Lucking emphasized that "the combination plan (proposed by the private power companies—with the Federal government working with private industry—is not the result of a seed that was sown a few months or even a few years ago."

(Continued on page 89)

NUCLEAR NEWS

GAS-COOLED, HEAVY WATER-MODERATED power reactor has been beset by "too many technical and economic uncertainties to justify further support from the AEC, the Commission decided. Announcing this last month, the Commission terminated its cooperative project with the East Central Nuclear Group and the Florida West Coast Nuclear Group, which had been working on this development project since 1958. The AEC thus turned down a proposal for contract revision providing for continuance of the R & D effort through 1962, presumably because the utilities would not provide sufficient assurance for the ultimate construction of a plant of 50-megawatt size. Commented Philip Sporn: "We are deeply disappointed in the Commission's decision . . . we have been optimistic that work would lead to construction of a prototype plant. We have felt from the beginning that there should be room in the AEC reactor development program for the partnership principle to encourage private groups . . ."

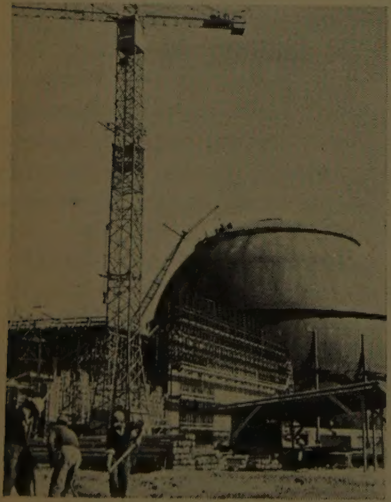
A-POWER PARTNERSHIP, in the view of Joint Committee Chairman Hollifield, though, "seems to have run its course, at least as the main vehicle for developmental plant construction." Congressman Hollifield concedes that this approach might have some merit as a supplement to a "strong" Federal program. Charging that "partnership" has delayed development and allowed privately owned utilities to "dominate a program largely financed with public funds," he would not have the U. S. program "dependent" on construction by investor-owned utilities. Arguing also for a healthy competitive situation in the atomic equipment industry, Chairman Hollifield said: "We cannot depend upon the controlled pace of monopolistic groups dictated by their own limited interests, to maintain this technological leadership."

PHILADELPHIA ELECT. CO. REACTOR, the high temperature gas-cooled concept planned for construction at Peach Bottom, Pa., cannot proceed until an R & D program has identified all failures which could lead to on-site or off-site hazards, the utility was informed by the Commission recently. V-P L. R. Gat replied to the AEC with information concernin such a research program already underway, indicating that reapplication for a construction permi can be expected this summer.

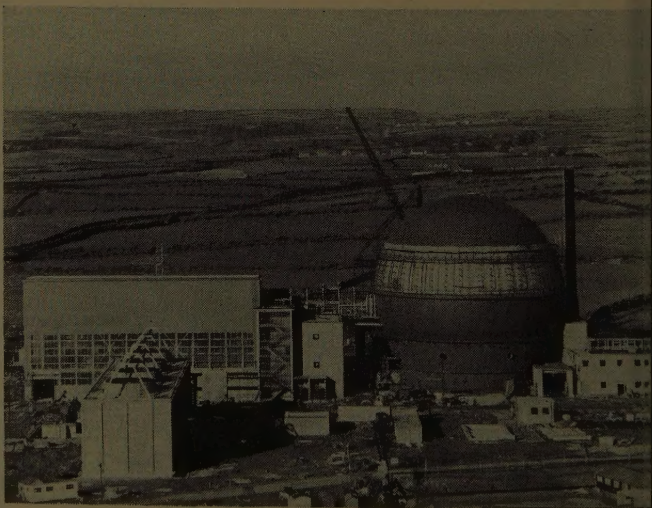
CONSTRUCTION OF ORGANIC-COOLED nuclear power plant, proposed for completion by the winter of 1964 65, will be subject to a decision expected to be mad by the AEC before the end of this year. Four o nine publicly-owned utility organizations which responded to a Dec., 1960, invitation of the AEC, hav been invited to make proposal for participation i undertaking the prototype 50-megawatt project, incorporating the organic-cooled and moderated reactor. They are: Burlington (Vt.) Light Dept Dairyland Power Co-op (La Crosse, Wis.), Gran River Dam Authority (Vinita, Okla.) and Plain Electric G & T Co-Op (Albuquerque, N. M.).

TO BOLSTER INDUSTRY PARTICIPATION in the U. S atomic energy program, a newly established Office o Industrial Participation is now functioning as a foca point for industry relations with the Commission, a well as a study and appraisal unit.

INDUSTRY ORGANIZATION MOVES announced in recent weeks include: *Allis-Chalmers* naming of Harold Etherington to head up the company's atomi energy division in Milwaukee, with Henry C. Nicke to succeed him as manager of the A-C nuclear powe dept. in Washington; new *United Nuclear Corp.* no combines the business and assets of Nuclear Development Corp. of America (headed by John H Menke) and the nuclear divisions of Olin Mathieso and Mallinckrodt Chemical Works. Olin's V- Wm. C. Foster heads United Nuclear, which has a initial net worth of $17-million; *Atomics International* has been reorganized under six new function divisions, "to carry out expanding programs in nuclear power and space;" *Nuclear Science and Engineering Corp.* has designed a "new radiation safet service program" under Robert G. Gallaghar.



Nuclear powerplants nearing completion in Europe include the SENN project near Naples, Italy (left photo) a 150,000-kw station involving a GE- supplied nuclear system, scheduled for operation early in 1963; and the Advanced Gas-Cooled Reactor at Windscale, UK (right photo)—called "a big advance in in the development of the gas-cooled, graphite-moderated reactor." The UK plant will operate at a temperature over 200-C. higher than the earlier design used at Calder Hall notes the UK Atomic Energy Authority.



WASHINGTON OUTLOOK

BY RALPH ELLIOTT
WASHINGTON EDITOR

New Frontiersmen Spark Public Power Movement

Part of the New Frontier's Washington bureaucracy is fast developing into a powerful, taxpayer-financed propaganda outlet and planning headquarters for the public power movement in this country.

This mischievous picture readily comes to the surface with a stirring up of the administration's power policy proclamations together with recent speech-making of officials in top power-related jobs. It hardly needs repeating that the boastfully spelled-out policies form a blueprint for aggressive expansion of government activities, and that President Kennedy has announced his administration's intention to broaden what it conceives to be the federal utility responsibility.

Now the public ownership sympathizers, so carefully picked to run the government's power affairs, are as much as saying to municipals, PUD's and electric co-ops: Come unto us, and we will salve your wounds we insist you received over the past eight years, and will solve your problems of the years ahead. All you have to do is work with us, plan with us, and follow our leadership.

For example, Assistant Secretary Kenneth Holum, Interior's top power man, had this to say in a recent speech to the American Public Power Association's annual meeting:

"In the spirit of cooperation and public interest, I call upon you and all other representatives of consumer-owned power systems to join your efforts with ours so that we may hasten the day when the United States has the most efficient electric power supply and distribution arrangements which modern engineering can design." Interconnection of isolated systems, he said, "must be attacked with greater determination," and "where it is possible to interconnect with a federal power system, all concerned must work together for the common objective of maximum benefits to the consumers in compliance with recognized public policies."

"Differences" among local public systems, and between them and federal power agencies, Holum declared, have been magnified out of proportion. "To some extent it is the result of failure to exercise proper leadership at the federal level and to chart and follow a firm sense of direction." "No new starts" and "partnership," he added, "have offered little strength and sense of common purpose upon which to build cohesive action among the consumer-owned utilities."

In other words, now the time is right and the Washington climate is right for a coordinated public power push under federal leadership.

This backdrop adds color to the tone of talks by REA Administrator Norman Clapp before various electric co-op groups. Class has been showing much concern over co-op power supply in language that appears aimed in two directions: to encourage applications for generation and transmission loans; and to add weight to the G&T club which co-ops, in seeking "fair" power contracts, can hold over the heads of their utility suppliers.

Speaking at a co-op meeting in Oklahoma, Clapp noted that REA experts estimate that the demand on co-op systems will climb from last year's 29-billion kilowatt-hours to 196-billion by 1985. To meet this situation, "we are going to pursue an aggressive policy leading toward more abundant power and low-cost power for all rural Americans." He continued:

"We do not believe that it is enough to judge the desirability of new (REA-financed) generation and transmission starts from the standpoints of adequacy, dependability, and lower-cost alone (the standards heretofore applied). We also must be sure that cooperatives enjoy a supply of power . . . that will guarantee the cooperative device a permanent place in the American power industry. . . . We intend to use our G&T authority when our borrowers are unable to obtain the security they need through power contracts."

In seeking to justify this "security criterion," Clapp said that "as long as cooperatives across the Nation are under fire from commercial power suppliers, as long as there are tricky twists in wholesale power contracts, as long as territorial integrity is threatened, we are going to have to concern ourselves with the security aspects of each power supply proposal we receive. . . . You can put us down on the record now as opposed to any power contracts which call for dual rates or any other type of limitation aimed at denying a cooperative any legitimate consumer. If a co-op can't get a fair contract, and it asks REA for help, then we are going to have to take a look at the possibilities of generation."

He also noted REA's interest in proposed federal inter-ties, pointing out they "could well be the first important step toward a concept that has excited the enthusiasm of some Americans — and the indignation of others—for a number of years. I refer to the idea of Giant Power. . . . If the concept continues to arouse protest it is because the present inefficient method of transmitting power, the lack of inter-ties, has proved extremely profitable for a number of power companies."

It's no secret that the giant grid planners are looking to the possibility of substantial REA financing of steam generating capacity that could be integrated with federal hydro systems. How far the administration may try to go in that direction, and the extent to which Congress will stand still for it, remain to be seen.

Government power agencies, meanwhile, will go on churning out propaganda designed to enshroud their expanded activities with a "public interest" sanctity, and to lure local systems into taking a federal "helping hand" that could well land them, stripped of their independence, in a sprawling, government-dominated giant power set-up.

California Commission Devises New Way To Reduce The Rate Base

This is an order which will have far reaching repercussions not only in California but in other jurisdictions as well. The California Public Utilities Commission in a 3 to 2 decision ordered utilities under its jurisdiction to transfer accumulated tax deferrals currently in a tax reserve to the depreciation reserve. Furthermore, it ordered that all normalized annual accruals which arise from the use of liberalized methods of tax depreciation will be credited to the depreciation reserve. This is to be done not only for the future but *for 1960 as well.* Strong dissents were filed by President McKeage and Commissioner Mitchell.

The Commission's Order

This is a supplemental order to the one issued on April 12, 1960, in which the Commission ordered that for rate making purposes companies using the liberalized methods can only use actual taxes. This supplemental order which makes the rather pious claim to being only an accounting order is presumably designed to catch all those companies who have hitherto normalized taxes, but have not as yet appeared before the Commission in a rate proceeding.

The order noted in part that:

"It appears that there are some public utilities whose rates have been fixed on the basis, among other things, of an allowance for federal income taxes of amounts determined by the use of normal straight-line depreciation methods but which utilities since have elected to accrue on their corporate books, and to charge to income, their federal income taxes determined by the use of liberalized depreciation methods with the tax differentials, or savings, flowing through into surplus. It further appears that there are some utilities which, through normalization, have accrued tax reserves and carry such reserves on their balance sheets.

"The Commission has considered this matter and finds and concludes that the tax differentials, or savings, thus carried to surplus represent amounts collected from the ratepayers in excess of the amounts allowed by the Commission in fixing rates. The Commission's order in Decision No. 59926 was limited to the treatment of federal income taxes for rate-making purposes only, and we find and conclude that it is reasonable and proper, in order to protect the public interest, to enter an order at this time indicating accounting procedures to be followed with respect to such tax differentials, or savings, and prescribing the method to be followed in disposing of the tax reserves."

The Commission thereupon ordered:

"1. That every public utility under the jurisdiction of the Commission which now has accumulated tax reserves resulting from the use of liberalized depreciation methods in computing federal income taxes, except those utilities which prior to the date of this order have been authorized to dispose of such tax reserves, shall, on or before June 30, 1961 unless otherwise earlier authorized by this Commission, transfer the balances in such tax reserve accounts to depreciation reserve accounts and report such transfers to the Commission within ten days thereafter.

"2. That every public utility whose presently prevailing rate schedules have been fixed on the basis, among other things, of the inclusion in operating expenses of allowances for federal income taxes of amounts based on the use of normal straight-line depreciation methods but which since has elected, and does elect, to use liberalized depreciation methods in computing federal income taxes, shall, for each year beginning in 1960 and continuing until its rates for service shall have been fixed on that basis, charge income for such year and credit depreciation reserve accounts with amounts equal to the tax differentials, or savings, resulting from the use of liberalized depreciation methods, instead of normal straight-line depreciation methods, in computing federal income taxes."

Comment on Supplemental Order

By means of the foregoing rather transparent device the Public Utilities Commission has now put itself in a position of being able to deduct a fictitiously inflated depreciation reserve from a utility's plant account. There will be no argument now as to whether or not the tax reserve is a proper item for deduction in order to arrive at the rate base or whether a zero return should be attributed to it in arriving at the cost of capital. All this becomes academic once the accumulated tax deferrals are lodged in the depreciation reserve and their deduction becomes automatic.

Not only is such treatment patently unfair to the utilities, but seemingly the Commission when it is so minded can disregard the whole purpose of the depreciation reserve. The depreciation reserve is a measure of the service life expectancy of the property and in California is carefully computed by actuarial methods in order to arrive at the reserve requirement based on the remaining life of the property. All these finely spun mathematical theories are now conveniently jettisoned by crediting to the depreciation reserve amounts which have nothing to do with depreciation but arise from the normalization of Federal income taxes.

It would be equally logical for the P.U.C. to deduct the injuries and damages reserve, the reserve for uncollectable accounts, or for that matter the accounts payable if the end result is to be a reduction of the rate base.

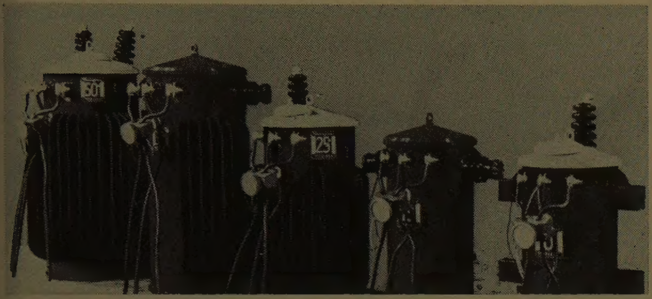
Furthermore, since the California utilities are on a remaining life basis, the P.U.C. will be in a position to state that since the reserve is over accrued on an actuarial basis, then the annual accruals to the reserve should be reduced, and this in turn should lead to a reduction in rates. The utilities would thus be put in double jeopardy first, because of the reduced rate base, and secondly, because smaller

(Continued on page 90)

ENGINEERING-OPERATIONS

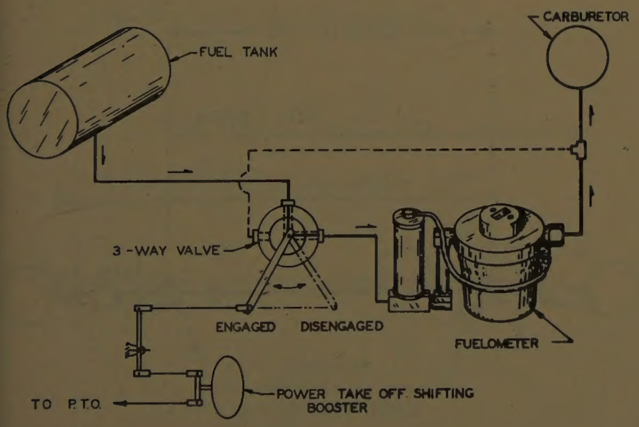
Signal Lights Help Manage Transformer Loading

Philadelphia Electric Company has just installed 300 signal light indicators which indicate economic limit of loading of conventional distribution transformers on their 25-, 37½-, and 50-kva units in urban and suburban areas. To eliminate dropping load during installation, a shunt path was provided on the secondary risers before disconnecting the two line leads. Then, it was only necessary to insert the line leads through the indicator case and connect the signal light leads at 120 volts. The utility regularly patrols transformers equipped with TL indicators, resets them after an operation, and keeps check in order to determine if a changeout is warranted.



Saves Thousands Via Gas Tax Rebates

One Eastern utility realizes important savings in costs of company truck use with accredited records which show how much gasoline is used for non-taxable, off-highway operations. Basis for the relatively inexpensive but accurate record keeping system is the installation of Servis Fuelometers on trucks used for both over-the-highway and power take-off service. When trucks are used on highways, a valve switch by-passes the fuelometer. However, when the unit is used for some other purpose than travel, the valve switch is thrown sending fuel through the fuelometer to record gallonage on which a tax rebate is due. Records from the device are acceptable to taxing authorities in the state involved.



High-Load Protector

Pennsylvania Power & Light Company has been using several of these plastic high-load protectors for two years with excellent results. Used as a replacement for "wire and tree boards," the sheets are less costly and lighter in weight. Installation cost per trip is said to be half that of wire and tree boards, with life expectancy in the five-years-or-longer range, protecting transformers, circuit breakers, etc., from low wires and branches. Abutco Plastics Industries, Inc., Hazleton, Pa., makes them.

Thawing Pit Linings Withstand Temperature Extremes

First year service records for the refractory linings of two coal thawing pits of the Illinois Power Co. at Alton, Ill., have indicated that the linings, made of Furnace Blok, a product of the Refractory and Insulation Corp., have required little maintenance and have shown little or no spalling.

Introduced about four years ago, Furnace Blok has found acceptance as a rapid, low cost means of building monolithic refractory walls of boilers and ash hoppers. Installation does not require any wooden forms.

K-DAR RELAYING MASTERMINDS FAULT CLEARANCE

Westinghouse K-DAR overreaching transfer-trip systems eliminate most of the transmission line protection problems.

By J. L. BLACKBURN, Section Manager
and G. D. ROCKEFELLER, Senior Engineer
Relay Department, Meter Division, Westinghouse Electric Corporation, Newark, N. J.

DURING the last decade microwave and audio-tone pilot-wire channels have developed into proven tools for line-relay protection. Coupled with these electronic advances, Westinghouse has designed two transfer-trip relaying systems that take full advantage of the capabilities of these mediums.

Review of Available Systems

Before examining these newly-developed relaying systems, a brief review of the present pilot systems might be worthwhile. A metallic wire circuit, the first method used, provides a straight-forward means of comparing current magnitude and phase angle between two or three terminals of a transmission line.

The second method, power-line carrier, superimposes a radio-frequency signal directly on the protected transmission line. Because of the potential of the fault interfering with the signal, a blocking rather than a tripping system has been used in power-line-carrier relaying. The blocking system requires the transmission of the carrier signal only for an external fault when the channel is sound.

When the signal is separate from the protected line, as is the case with microwave or audio-tone pilot wire channels, either a blocking or a tripping system can be used.

The following is an attempt to briefly explain the basic principles of several relaying methods:

For directional-comparison blocking systems the instantaneous fault-detecting relays for both phase and ground faults are directional and are set to overreach the remote terminal or terminals as shown in Fig. 1. If the fault is external to the protected line the channel is used to block all other terminals from tripping. Thus, for fault 1, relays at station I are ready to trip but a blocking signal from station II prevents this operation. Since the fault is in the non-trip direction for the relays at station II, no communication channel is necessary to prevent them from tripping.

For internal fault 2 (Fig. 1), the

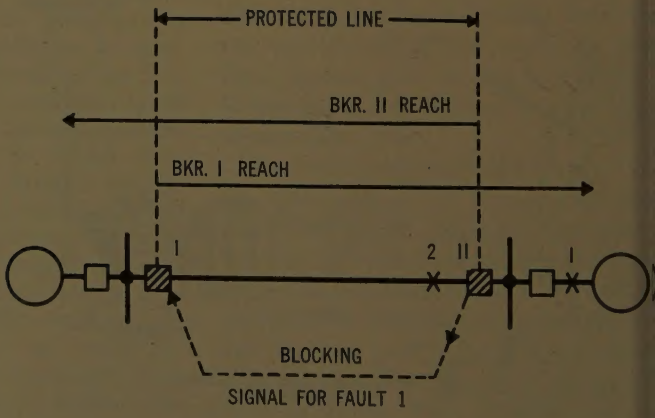


Fig. 1—Directional-comparison blocking system showing fault detection zones of the high-speed tripping relays.

relays at station I and II both operate and no communication channel is required for instantaneous-simultaneous tripping.

In the underreaching transfer-trip system the fault-detecting relays for both phase and ground faults must be directional and overlap, but must not reach beyond the remote terminal or terminals. This is shown in Fig. 2. For external fault 1 neither the relays at station I nor those at II operate. For the internal fault 2 the relays at station II operate and transmit—via the communication channel—a tripping signal for operating the breaker at station I. Note that the fault-detecting relays at station I do not play a part in clearing fault 2.

Westinghouse K-DAR Overreaching Transfer-Trip Systems

In the development of these overreaching transfer-trip schemes, an attempt was made to incorporate the best features of both the blocking and transfer-trip systems. They use a similar complement of directional fault-detecting relays, and the same overreach settings that are used with the directional-comparison blocking system. This is shown in Fig. 3. A "trip request" is transmitted when the local fault-detecting relays operate; this signal closes the remote receiver relay contact. However, the receiver-relay contact cannot initiate tripping unless the fault-detecting relays also operate.

For external fault 1 the relays at station I operate and send a trip request for the breaker at station II to trip. However, since the relays at station II do not operate for this fault, neither breaker is tripped. At station II the fault-detecting relays do not permit tripping. At station I the receiver-relay contacts remain open in the absence of a trip request from station II.

In contrast, for internal fault 2 the fault detectors operate at both breakers and both initiate a trip request. Therefore, both breaker trip circuits are energized through the fault-detector contacts and the receiver-relay contact, to clear this fault.

One of the problems in any system is the ability to trip for an internal fault with the other end of the line open. A practical case is re-energizing the line after an outage with the fault still existing. The worst case referring to Figures 1, 2 or 3 is tripping station I breaker for the internal fault 2, with breaker II open. The overreaching schemes of Figures 1 and 3 permit satisfactory tripping while the underreaching system of Fig. 2 does not. With the Westinghouse KA-1 and TT-8 schemes a trip-request signal is transmitted when breaker II opens. Therefore, the receiver-relay contact at breaker I is closed, so that for any subsequent fault the fault-detecting relays can immediately trip breaker I.

The KA-1 system has been built around the new K-DAR family of distance-and-channel auxiliary relays and with a new transfer-trip auxiliary relay—the type KA-1 relay. The major components of the system are shown in Fig. 4.

Referring to Fig. 4, tripping occurs through phase fault contacts Z2 $\theta\theta$, Z2 3θ, or through the ground fault D_0 and I_0 contacts of the fault-detecting relays, and through X, TS, 94 and 52a contacts. X is a time delay auxiliary unit, TS is the manual-operated test cutout switch, 94 is the channel receiver relay and 52a is the breaker.

When a ground fault occurs in the protected line, D_0 and I_0 close at both stations, initiating a trip request by keying the channel transmitter through rectifier D_4. The instantaneous reception of the signal closes the receiver-relay contacts 94 at both stations, causing tripping. Phase faults are cleared in a similar manner, except that the transmitter is keyed through rectifiers D_1 and D_3. The other rectifiers, D_2 and D_5 with D_1 are used to block various sneak circuits.

When a fault is detected, X1 unit is energized to perform three functions:

1. One X1 contact acts as a safety valve and parallels the

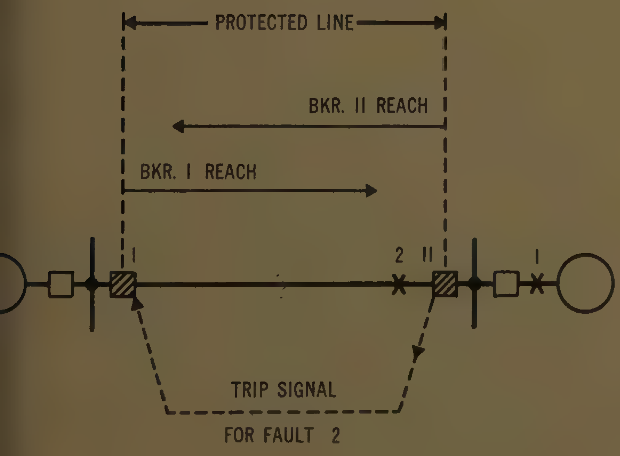


Fig. 2—Underreaching transfer-trip system showing fault detection zones of the directional high-speed tripping relays.

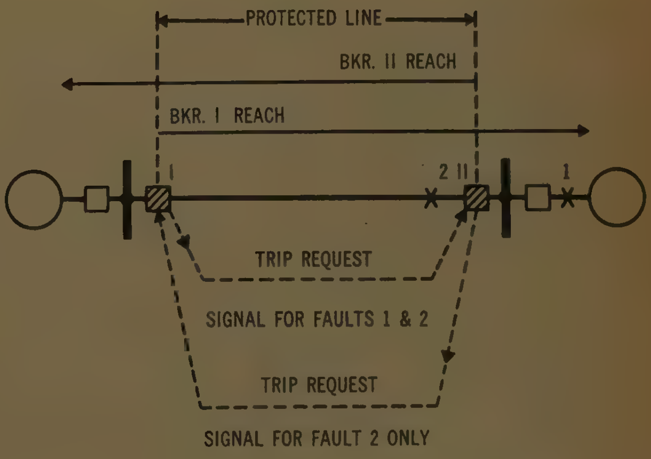


Fig. 3—Overreaching transfer-trip system showing fault detection zones of the directional high-speed tripping relays.

X contact in the trip circuit to provide a time-delay trip should the X contact open prematurely.

2. During a breaker trip, the trip-request signal is continued for 3-5 cycles, through the 52b and X1 contacts, to insure that the signal is not prematurely removed.
3. One X1 contact energizes the X2 coil, which permits reset of the keying circuits, after an external fault is cleared.

When a trip request is received the transient blocking unit, X, is energized by the 94 contact, through the normally closed X2 contact. After about 1.5 cycles the X contact in the trip circuit opens to insert the X1 unit delay into the trip circuit. This X1 delay insures that the 94 contact opens before the fault-detecting contacts close when a sudden reversal in the direction of fault-power flow occurs during an external fault.

An example of where this reversal can occur is shown in Fig. 5, for fault 1. Initially power flows to the right in the protected line. A fault-detecting relay operates at breaker I, transmitting a trip request to breaker II, which closes the 94 contact, energizing X at breaker II. Now, assume that breaker III opens before breaker IV. When breaker III opens, power flows in the protected line reverses, operating a fault-detecting relay at breaker II. Immediate tripping is prevented, even though the 94 contact has not yet opened at breaker II, because the X contact is open. Thus, the receiver relay contact at II need not open immediately, and its opening can be delayed until the X1 contact closes 1-2 cycles later.

For fault 2, the X contact does not open until after the breaker trip circuit has been sealed; therefore, there is no delay in tripping for an internal fault, except for the time required to close the 94 contact in the trip circuit.

Breaker I in Fig. 3 can still trip even though breaker II is open. When breaker II opens, a trip request is keyed by 52b contact through the Z3 θθ, Z3 3θ, I_{os} back contacts and rectifier D_5. A subsequent internal fault can be cleared at breaker I by Z2 or $D_0 + I_0$ contacts through the preclosed 94 contact after energizing X1 coil and closing X1 contacts in the trip circuit.

It will be noted that a "repeat circuit" is provided through the normally closed Z3 θθ, Z3 3θ and I_{os} contacts, and the normally open X contact in Fig. 4. If an internal fault is not detected at the local station because of insufficient fault current to operate the fault detectors, the local transmitter, on receipt of a trip request from the remote station, will retransmit the received signal through closing the X contact in this repeat circuit path. Thus, the remote breaker is allowed to trip at high speed for a weak feed source. This feature is particularly valuable for multi-terminal or tapped lines where the tap is a very weak source of fault power.

The repeat circuit of breaker II is disabled for fault 1 of Fig. 3, by the operation of either the I_{os} or one of the Z3 contacts which open the keying path. Note that I_{os} is non-directional; and that the Z3 units are connected to operate for faults in the opposite direction to that of the Z2 units, in order to reach into the external system.

During a trip operation the X unit in Fig. 4 will be momentarily energized, closing the repeat circuit. In order to prevent both transmitters from being locked into the "trip request" frequency by their repeat circuits after the fault is cleared, the X2 coil is energized,

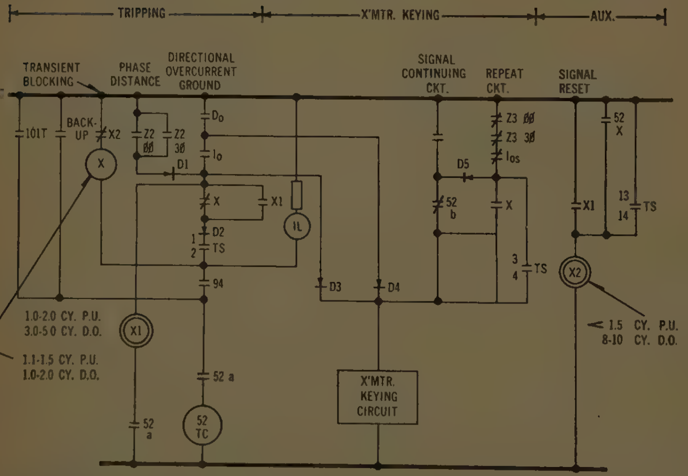


Fig. 4—Simplified tripping and control circuits for use with K-DAR/KA-1 overreaching transfer-trip system.

A) Channel:

94—Receiver relay contact—closes on receipt of "trip-request" signal.

"Transmitter keying circuit"—a trip-request signal is transmitted when battery voltage is applied to this circuit.

B) Directional fault-detecting relays:

D_0, I_0—Directional and overcurrent units, respectively, of ground faulty relay, type KRC, KRP, KRD, or KRQ.

Z2 φφ—Phase to phase unit of phase distance relay, type KD.

Z3 3φ—Three phase unit of phase distance relay, type KD.

C) Auxiliary relays:

I_{os}—Ground fault overcurrent unit of transfer-trip auxiliary relay, type KA-1 (Not directional).

Z3 φφ, Z3 3φ—Phase distance units of KD-1 relay. (Set to reach into external system.)

X, X1, X2—time-delay auxiliary units of transfer-trip auxiliary relay, type KA-1.

D) Power Circuit Breaker (52):

52a—Auxiliary-switch contact; open when breaker is open.

52b—Auxiliary-switch contact; closed when breaker is open.

52TC—Breaker trip coil.

which in turn deenergizes X to reset the keying circuits.

To test the channel, the local test-cutout switch TS is turned from the "on" to the "test" position, closing TS contacts 3-4 and 13-14. A trip-request signal is transmitted, lighting the remote indicating lamp IL. The remote repeat circuit causes re-transmission through contact X. Receipt of this signal locally constitutes a successful checkback. Contact 1-2 of TS remains closed during this check so that tripping is not disabled. This contact opens only when TS is in the "off" position.

K-DAR/TT-8 System

The TT-8 system was designed for those who want a less sophisticated arrangement than the KA-1 scheme. The basic difference in the two systems is that the TT-8 does not provide a repeat circuit. Accordingly, single-end feed tripping is not accomplished when all breakers are closed. Furthermore, test checkback is not available.

The KD-1 and KA-1 relays are not used with the TT-8 relay; otherwise the same complement is required.

The TT-8 relay consists of three telephone-type auxiliary units (X, X1 and X2) and three blocking rectifiers (D1, D2 and D3), as shown in Fig. 6. The operation of this scheme can be followed as explained in connection with Fig. 4.

Comparison of the Relay Systems

The differences in the various systems just considered are summarized in Table I.

Single-end-feed tripping with both breakers closed is possible with the KA-1 system, but not with the TT-8 scheme. Such a condition is much more likely to be encountered on a three-terminal line, where it is not always practical to set the fault-detecting relays at all three stations to see an internal fault.

However, to illustrate the point, refer to Fig. 3 and assume that breaker II current is zero or insufficient to operate the fault-detecting relays. With this "single-end-feed" condition breaker I will not trip, if the TT-8 system is used. The same is true of the underreaching transfer-trip system, if the fault is in the end zone at 2.

However, breaker I will trip if the KA-1 scheme is utilized, because of its "repeat-circuit" feature. When the breaker I relays detect the fault and key a trip-request signal, the repeat circuit at breaker II "repeats" the signal, closing the receiver relay at breaker I. When the return signal is received at breaker I, tripping is permitted.

A problem which is solved by both the underreaching and overreaching transfer-trip systems, but which is not solved by the carrier-blocking system is the high-speed tripping of a "weak-feed" tap—see Fig. 7. The term "weak feed" means that power system W contributes very little current to a line fault.

For this condition the directional-comparison blocking system of Fig. 1 is limited because the current contribution from W is not enough to operate relays at that station, particularly for faults near station I or II. The underreaching transfer-trip system of Fig. 2 sends a tripping signal to both remote terminals with the principle problem being to set the relays at station I and II overlapping and reaching into the transformer bank, but not overreaching any remote terminal. The problems of multi-terminal lines are quite varied and are discussed in more detail in reference 1.

With the overreaching transfer-

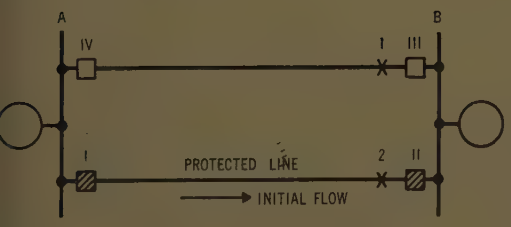


Fig. 5—For fault 1 the direction of power flow through the protected line reverses when breaker III opens prior to the opening of breaker IV.

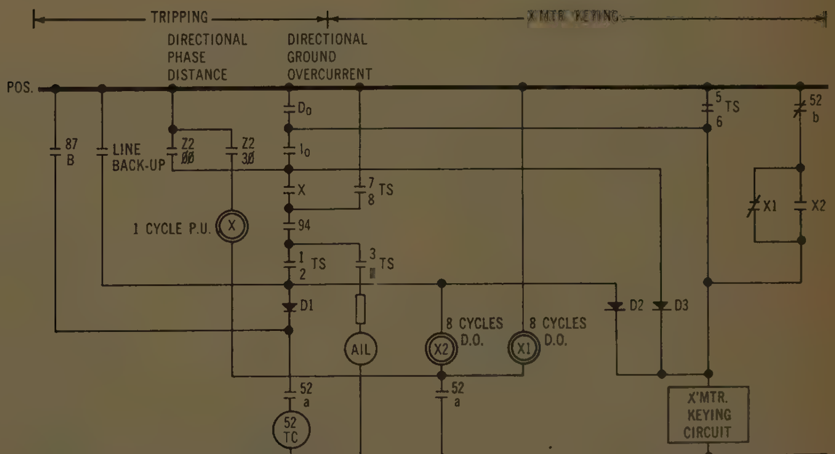


Fig. 6—Tripping and control circuits for K-DAR/TT-8 overreaching transfer-trip system.

trip systems, the directional fault detecting relays at breakers I and II can usually be set to see all line faults, but not reach through the bank to see fault 1. Therefore, if both breaker I and II relays operate, then the fault must be on the protected line. Thus breaker III is tripped, if trip request signals, F_1 and F_2 are received from both breaker I and II, with no fault detector operation required at breaker III.

The next item considered in Table I is whether or not tripping is delayed for coordination purposes. With the blocking schemes a delay is used to give sufficient time for the blocking signal to arrive. No such delay is required with the underreaching transfer-trip system, since the channel is not required for external faults. Likewise there is no trip delay with the KA-1 scheme, although one is used with the TT-8 system.

The final item in Table I concerns channel testing where at least one of the stations is unattended. An optional feature is available with the blocking systems, providing for the unattended station to retransmit a signal back to the initiating station. This feature is not available with the underreaching and TT-8 transfer-trip arrangements. However, the repeat circuit in the KA-1 scheme does provide this test checkback.

Installation of the KA-1 scheme, representing about eight relay-terminal years of experience, among several electric utilities, confirm the soundness of the design. All of these use microwave channels. Operation has been correct for all faults, including several internal faults and close-in external faults. There have been no false operations reported.

Over thirty additional relay terminals should go in service in 1961, consisting of both the KA-1 scheme and the newer TT-8 system. About half of these will use frequency-shift audio-tone channels rather than microwave.

Summary

High-speed, simultaneous clearing of all line faults can be effected with the K-DAR overreaching transfer-trip systems. These have been designed to take advantage of the capabilities of microwave and audio-tone pilot-wire channels. Two systems are available, utilizing the KA-1 and TT-8 transfer-trip auxiliary relays. While similar, these systems offer a different quality level of protection. The TT-8 scheme is simpler, but less sophisticated than the KA-1 scheme. Both the KA-1 and TT-8 relays, in conjunction with standard K-DAR fault relays, achieve faster, more complete line protection than is available with either the directional-comparison blocking or underreaching transfer-trip systems.

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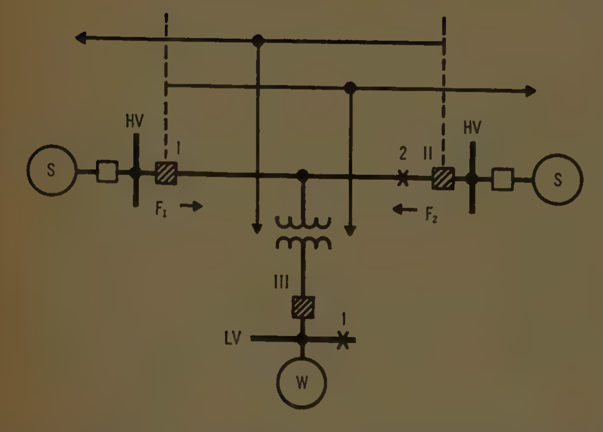

Fig. 7—Breaker III is tripped for fault 2 upon simultaneous receipt of frequencies F_1 and F_2 when using an overreaching transfer-trip system at breakers I and II.

TABLE I
SALIENT DIFFERENCES IN THE RELAYING SYSTEMS

	Dir. Comp. Blocking	Under-reaching Transfer Trip	K-Dar Overreaching Transfer-Trip KA-1	K-Dar Overreaching Transfer-Trip TT-8
Fig. Reference	1	2	3	3
Meaning of Signal	Blocks Trip	Orders Trip	Requests Trip	Requests Trip
Fault Detecting Relay Setting:				
Overreaching	X		X	X
Underreaching		X		
Bkr. I Trip for Fault 2, With Bkr. II Open?	Yes	No	Yes	Yes
Bkr. I Trip with Single-end Feed Through Bkr. I, when Bkr. II is Closed?	Yes	Note 1	Yes	No
High Speed Trip of Weak Feed Tap. (See Fig. 7)	No	Yes	Yes	Yes
Delay in Tripping For Coordination?	½ Cycle	No	No	Yes
Test Checkback from Unattended Location?	Note 2	No	Yes	No

Note 1 Yes, except for remote end-zone faults at 2.
Note 2 Yes, by adding a timing relay at the unattended station.

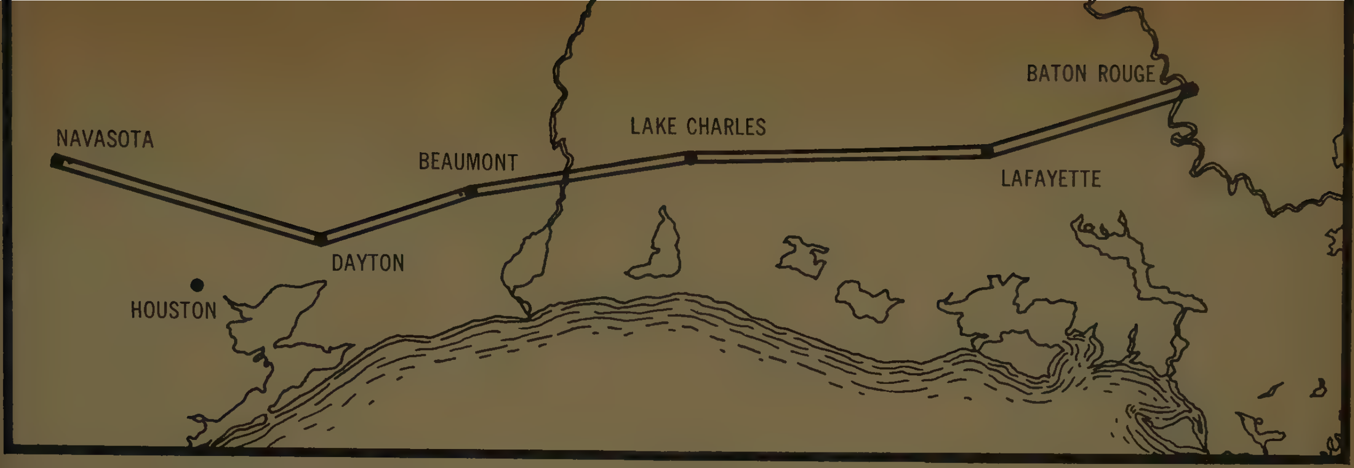

Fig. 1—General route of original line, which was reconductored, and new line paralleling it on the same right-of-way.

CONDUCTOR	CONDUCTOR COST	CONDUCTOR INSTAL. COST	STATIC COST	STATIC INSTAL. COST	E S & C	STRUCTURE COST	TOTAL COST/MILE
ACSR	$7523.73	3009.49	363.00	145.00	2280.84	7530.69	$20,852.75
ALL-ALUM.	$6166.99	2466.78	363.00	145.00	1828.35	7399.20	$18,369.32

Fig. 2—Installation cost comparison between 1033.5-mcm ACSR and all-aluminum conductor.

APPLICATION OF ALL-ALUMINUM CONDUCTORS TO TRANSMISSION LINES

Appreciable savings were realized by employing all-aluminum rather than ACSR, but sagging difficulties erased some of the gains. Experience indicates satisfactory performance for large sizes in the light loading district.

By **CLINTON E. CALVERT**, Project Engineer, Gulf States Utilities Company

A SUDDEN INFLUX of large industrial loads into the Gulf States' service area in 1956, coupled with load studies, indicated needed increases in generation capability that would nearly double system capacity by 1960. Board studies indicated that generation was needed at two new locations, and that a considerable increase in transmission capability would be required to transport the new capacity. At that time the transmission system consisted of a 138-kv, 4/0 copper or equivalent, line from Baton Rouge to Dayton, Texas (184 miles) and a 69-kv paralleling line to serve specific areas along the route. (Fig. 1.)

Increased right-of-way costs, and capability needed dictated reconductoring the existing 138-kv and 69-kv lines and also constructing a new 138-kv line along the same right of way. Calculations and economic studies for the 138-kv system indicated that 1,033.5-mcm conductor would better serve our needs than 795-mcm conductor. Estimated conductor cost per mile of 795-mcm all-aluminum was $15,500 with a normal (1) thermal rating of 134 mw at .8 pf; cost of this hauling capacity, if constructed new, was $115.50 per thermal megawatt mile. Estimated conductor cost per mile of 1,033.5-mcm all-aluminum was $2870 more than the smaller conductor, but cost of thermal hauling capacity was only $102.50 per thermal megawatt mile, a savings of $13 per thermal megawatt mile.

All-Aluminum vs. ACSR

Economic studies also indicated a savings of $2500 per three-phase mile by using the 1,033.5 all-aluminum conductor rather than the same size ACSR. Inasmuch as there were 184 miles to be reconductored and 184 miles of new line to be constructed, an estimated savings of $920,000 was indicated for the 368 miles of line. (Fig. 2.) For the 69-kv system, 795-mcm all-aluminum conductor proved as economical as had the 1,033.5 all-aluminum for the 138-kv system.

Special Considerations

Conductor manufacturers recommended a stringing block with an aluminum alloy sheave, sealed ball bearings, and sheave diameter of 12 to 14 times the conductor diameter. The block finally selected met recommendations and had a parabolic shaped sheave groove that would accommodate both the 795-mcm and 1,033.5-mcm conductors.

Conductor manufacturers also recommended pulling conductors with Kellems pulling grips. These have proved satisfactory, holding up well in service and pulling through blocks easily. Tension and loop splices selected are compression type; aluminum compression sleeves were applied to all-aluminum conductor in the same manner that had previously proved very satisfactory on ACSR. Bolted deadend clamps were selected in preference to compression and preformed types.

Tension pulling was used when stringing conductors over energized transmission or distribution lines. When reconductoring, the existing line was placed in stringing blocks; new and old conductors were fastened together with Kellems pulling grips, and the new all-aluminum

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Editor's Note—This is an adaptation of a paper presented by the author at 80th meeting of the Transmission and Distribution Committee, Edison Electric Institute.

conductor threaded through a braking or tension machine. As the old conductor was wound on a reel, a retarding force applied to the braking machine kept both old and new conductors under tension. When installing a new line over distribution, a hemp rope was initially placed in stringing blocks and the same tension pulling procedure followed.

Our preferred method of stringing is the pay-out method since the terrain in the service area is flat and the ground is without rocks or other material that would damage conductors. However, guard structures were constructed for protection over railroads, roads, overhead lines, and fences. Round crossarms were used on guard structures rather than stringing blocks; these do not impede conductor movement and they do not groove or splinter as do square arms. As conductors were paid out past line structures, they were placed in stringing blocks to keep them off the ground as much as possible.

Prestretching

Our standard practice with copper and ACSR conductors had been to pull them to prestretch tension, snub off and hold for 30 minutes, then sag to final sag. Since this method also served to test splices, angle structures, and deadend structures, we saw no reason to change the procedure for the 1,033.5-mcm all-aluminum conductor. Almost all failures that had previously occurred during prestretching were traceable to human error, improperly tightened guy clamps, incorrectly installed anchors, omission of lag screws, etc.

Instructions were issued to prestretch the 1,033.5-mcm all-aluminum conductor to 7300-lb, hold for 30 minutes, then sag to final sag which called for ground clearance of about 27 ft at 60 F for 600-ft ruling spans. About 76 miles of new line, Lafayette to Lake Charles, were constructed in this manner.

When we installed the conductor, we thought we were sagging it to the final sag as we had with copper and ACSR. Prestretching of the latter conductors removes most of the non-elastic stretch but not all. Their rate of creep, however, is small and, although it never stops, it becomes small enough to be negligible. Such is not the case with all-aluminum conductors, for, about two months after installation we began receiving complaints of excessive sagging from our operating people. Field checks revealed a quite noticeable two feet of extra sag. Natural creep of all-aluminum conductors, of which we knew very little, caused this much sag. Investigations with field forces and manufacturers made it clear that we were only *partially* prestretching conductors and that prestretching would not permit installation of all-aluminum at final sag.

Results of "initial" sagging by the method described above are shown in Fig. 3. However, we found that the conductor reacts differently when a pull of 7300-lb is *held* for 30 minutes (rather than snubbed off for 30 minutes) before sagging (see Fig. 4). Note that final 60 F sag after ten years is six inches less with tension 122-lb more than when prestretching by the "snubbed" method. We installed 41 miles of conductor by this method.

When we have more line than can be sagged in one sagging, we now hold the full prestretch pull for 30 minutes, then sag as indicated in Fig. 5. This results in eight inches less sag at 60 F and 194-lb more tension after ten years than for the same period using the "snubbed" method, even though initial sag tension of the latter was higher.

Effect of Temperature

Our experience thus far with sagging of large sizes of all-aluminum conductor indicates that conductor temperature rather than ambient air temperature should be used to determine sag tensions. We believe that the mass of the larger all-aluminum conductors absorbs and stores heat, causing conductor temperature to lag behind ambient air temperature changes, perhaps as much as 20 F. Observations of men in the field verify that with approximately the same ambient temperature, conductor sag at span center will sometimes vary nearly three feet. Our recommended method of determining conductor temperature is to read a thermometer taped to a section of the same size conductor as that being installed. This section should be kept somewhere near the location where the conductor is being sagged. When checking sags of conductor, temperature rise due to load current, of course, must be added to temperature determined by the thermometer.

Sagging Procedure

Initial sagging was done with an engineer's level transit. Two adjacent structures of equal elevation were selected and a large target board was placed on one structure a distance of the crossarm equal to the sag. The level was mounted on the other structure in a similar manner. The vertex of the sagging conductor was then lined up between these points with the level. In field checking the sag of all-aluminum conductors, we found the stop watch method best suited for our personnel. We time to the third return. An average of several stop watch readings have been checked with a transit and have been found to be accurate.

After the conductor had been paid out and was ready for sagging, it was normally temporarily attached to a suspension structure or temporary anchor at the end of the pull. Conductors were prestretched against the deadend insulators as our standard 5¾ in. minimum structure insulator is the 15,000-lb M&E insulator having a recommended safe working load value of 7500-lb and our prestretch tension was 7300-lb. After partially prestretching a conductor, tension was reduced to below sag tension and then returned to sag tension. The conductor was then clipped-in on all except the three structures nearest the next pull.

Sometimes several days went by between the stringing of the first and second sections. In that time, the conductor of the first section crept so that tension was less than stringing tension of the second tension; pulling the second section against the first section, therefore, increased tension of the first section above design tension. This objection was overcome by pulling the conductor of the second section against a structure or temporary guy rather than against the conductor of the first section.

The longer the period before making up the tension splices, the nearer the tensions of each section approached each other, although never becoming theoretically equal. Time required to "clip-in" a section of conductor permitted creepage to sag the two sections within an inch or two of each other.

Recovering Ability of All-Aluminum

In June 1957 when Hurricane Audrey played havoc throughout our system, the 138-kv all-aluminum lines faired very well. We had one broken structure and a tree blew across the south conductor of one of the all-aluminum lines. The tree forced the conductor all the way to the ground from about 28 feet in the air. Our general line foreman, based on creep he had observed, was certain that "slack" would have to be removed from the 1,033,500-cm conductor. However, when the tree was cut away, the conductor swung back into place, assuring us that all-aluminum conductors have a great deal of recovering ability.

To determine the best method of correcting impaired clearances caused by creep, we contacted the conductor manufacturers requesting that they verify our calculations and also calculate the effect of the hurricane on the sag. The conductor was creeping faster than we had predicted even after correcting for "partial" prestretching. The manufacturers stated that the 105 mph velocity of wind during the hurricane had caused the conductor to sag only 0.2-ft more at 60 F than it would have for 30-day creep.

For the next year we tried to determine the reason for the accelerated creep. During this time, one conductor maunfacturer noted that he had supplied us with the creep curves for 7-strand rather than 37-strand conductors. However, the conductor manufacturer furnished us with estimated creep curves for 37-strand all-aluminum conductor which they felt would be adequate. As of November 14, 1960, they furnished us with actual 37-strand creep curves for all-aluminum. A preliminary review of these actual creep curves indicates that their estimated creep curves are about the same. In sagging, we provide for additional sag which may be caused by heat absorption and load current.

To correct the impaired ground clearances of our original installation of all-aluminum, we are now

(Continued on page 91)

UNLOADED	SAGS (INCHES)			TENSIONS (LBS.)		
	INITIAL	AFTER 1 YEAR	AFTER 10 YEARS	INITIAL	AFTER 1 YEAR	AFTER 10 YEARS
30F	119	134	145	4383	3896	3653
60F	140	156	165	3734	3369	3206
90F	161	176	184	3287	3003	2857

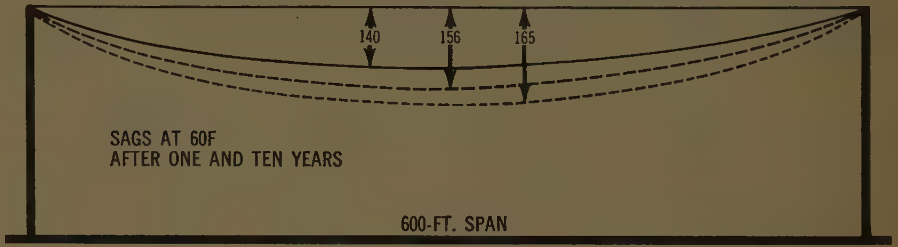

Fig. 3—Sags and tensions of 1033.5-mcm all-aluminum conductor when pulled to 7300-lb tension and snubbed for 30 minutes.

UNLOADED	SAGS (INCHES)			TENSIONS (LBS.)		
	INITIAL	AFTER 1 YEAR	AFTER 10 YEARS	INITIAL	AFTER 1 YEAR	AFTER 10 YEARS
30F	119	128	137	4383	4059	3815
60F	140	150	159	3734	3480	3328
90F	161	170	178	3247	3109	2963

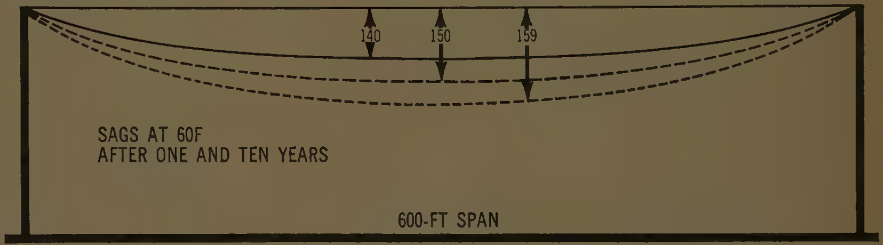

Fig. 4—Sags and tensions of 1033.5-mcm all-aluminum conductor when pulled to 7300-lb and held at this tension for 30 minutes.

UNLOADED	SAGS (INCHES)			TENSIONS (LBS.)		
	INITIAL	AFTER 1 YEAR	AFTER 10 YEARS	INITIAL	AFTER 1 YEAR	AFTER 10 YEARS
30F	97	107	118	5398	4911	4383
60F	118	128	140	4464	4075	3734
90F	138	151	161	3774	3523	3247

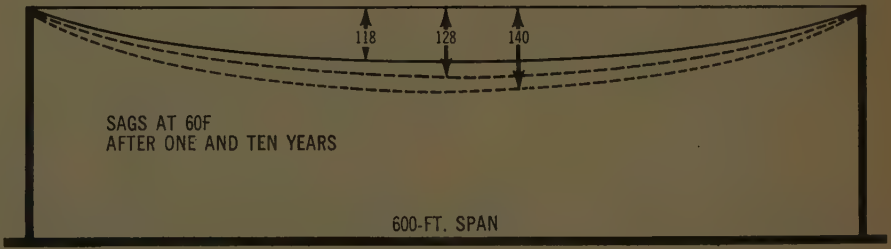

Fig. 5—Sags and tensions of 1033.5-mcm all-aluminum conductor as presently sagged, with estimated sags after one and ten years.

PRIVATELY-OWNED DISTRIBUTION SYSTEM CUTS SERVICE COSTS FOR OFFICE BUILDING

Economy of cost, space, and power charges; flexibility for future expansion; efficiency through location at load centers . . . result from buying power at 13.2 Kv.

By **DANIEL B. STEVENSON**, Consulting Engineer, Des Moines, Iowa

WHEN business growth required that the Bankers Life Company, Des Moines, expand its office space by nearly 50 percent to house additional staff and data processing equipment, the company was confronted with many new problems. Added to the normal problems of determining loads and locations of lighting, air conditioning and machinery was a new problem created by a power company proposal to supply 13.2-kv service instead of the existing 4160-volt service.

Previous policy of the utility had been one of supplying power at final required voltages. Now it is one of encouraging large customers to purchase power at higher primary voltages and assume responsibilty for transformation to utilization voltages. To encourage the trend, rate structures have been revised so that a very tangible reward results from purchase of the higher voltage power. This policy, in effect, placed Bankers Life in the utility business on a modest scale because they were required to purchase and install transformers, switchgear, and related equipment. They will have to maintain it as well.

Building Expansion

The addition was planned to provide added space and also to allow even further expansion in the future. It incorporates data processing equipment, a separate air conditioning plant, electronically controlled conveyors to carry papers between floors, and a 12,000-sq ft cafeteria and lounge area.

The addition consists of seven floors and basement, plus penthouse, and is the same height as the original building. It provides approximately 100,000 sq ft of floor space.

Original Building and Service

The original building, completed in 1940, was considered to be a model of good planning and construction. It received power from Iowa Power and Light Company in the form of 4160-volt service with three separately metered services — 4160-volt, three-phase air conditioning; 120/208-volt, three-phase, four-wire lighting; and 208-volt, three-phase, three-wire power. The latter two services were provided by transforming from 4160-volt primary service, with separate transformer banks for each service.

The service installation was completely contained in a three-compartment transformer vault located in the building. This contained such equipment as open bus work, cables in racks, fused cut-outs, and single phase distribution transformers. All vault equipment was owned and maintained by the power company and only power company personnel had access to this vault.

When the original building was constructed, availability of equipment for higher service voltage was not such as to encourage the customer to undertake this responsibility. Developments in electrical equipment design and construction have now provided more efficient factory-assembled equipment, making it advantageous for customers with sufficient load to take delivery of energy at voltages several times higher than utilization voltages.

The New Service

Load growth in downtown Des Moines had led the power company to construct a 13.2-kv primary distribution system and to drop the 4160-volt service wherever possible. Subsequent rate studies indicated that energy should be purchased at primary voltage, and the power company agreed to vacate the transformer vault so that the space could be used for the customer's service and distribution equipment.

As far as electrical loads are concerned, the addition is virtually a separate building. It has a nearly complete mechanical plant and is self sufficient in refrigeration for air conditioning. Connected load is about 1450 kva compared to 1700 kva for the original building.

By utilizing factory-fabricated unit substations in the addition it has been possible to effect economical use of space and to place necessary equipment conveniently close to load centers.

Utilization voltages within the addition were generally set up on the basis of 277/480 volts for the basic system with local retransformation to 120/280 volts where needed. Small power and lighting loads are more or less uniformly distributed on all seven floors. A single bus duct riser serves these loads. For the typical individual office floors, all distribution equipment is located in a wire closet serving its own floor. Various panels and telephone facilities are also located in these closets.

Bulk of the lighting is fluorescent, operating on 277 volts. There is some 120-volt incandescent lighting, and this voltage is also used for office machines, portable appliances, etc. Large motors operate at 480 volts.

Substations

Two 277/480 volt substations are provided in the basement, each of

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Editor's Note: Architects for both the addition and the original building were Tinsley, Higgins, Lighter and Lyon. The author was consulting engineer for the architects and designed the complete mechanical and electrical installations.

750-kva capacity. Loads are divided so that all lighting and some small power is on one and all large power is on the other. By separating loads in this way, substations were kept the same size, and it was not necessary to be overly concerned about motor starting loads. The two 150-hp refrigerating machines are started across the lines as are all other motors.

These substations are fed from a single primary feeder. Provision is made for future addition of a second primary feeder to the substation area and for adding a second substation to serve additional refrigeration machinery for the next stage of building expansion. The planning of the mechanical plant calls for locating refrigerating machinery for the second addition in the first addition and for providing a second primary feeder. Still another primary feeder will be run directly from the Service Vault to the second addition to serve its lighting load and its power load, exclusive of air conditioning.

Raceways in cellular steel floors are used for distribution to floor outlets. This results in greater flexibility in locating service outlets than in the original building, where underfloor ducts in floor fill were provided.

The cellular floor system is developed on a three-raceway basis: power, telephone and signal. Cells are on six-inch centers, and cells for any one system are activated on a five-foot spacing. There is provision for future activation, at two-foot six-inch spacing where it may be necessary to open up additional cells.

There are two rather substantial blocks of 120/208-volt load in the addition. One of these is for the cafeteria area, located at third-floor level over the existing auditorium. A penthouse, at fourth-floor level above the cafeteria, houses air conditioning equipment serving this area and the fourth floor electronic computer area.

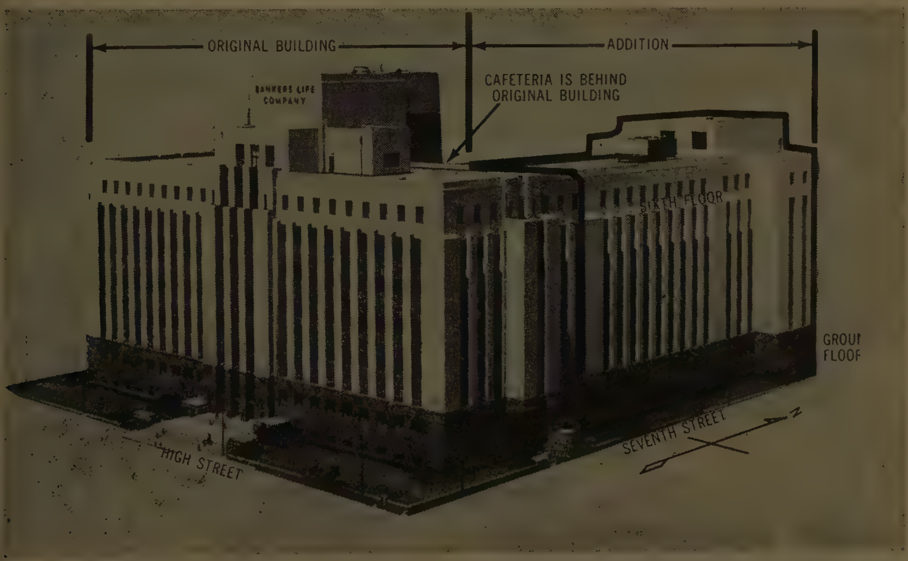
A 225-kva dry-type transformer in the penthouse serves the kitchen power and the incandescent cafeteria lighting. This transformer reduces from 277/480 to 120/208 volts.

The fourth floor of the addition is set aside for electronic computer equipment. A 150-kva substation is provided to serve this load at 120/208 volts by direct transformation from primary voltage. This gives better voltage regulation, avoids double transforming and consequently increases the effective capacity of the 277/480-volt substation.

Mechanical plant power for the addition is largely in the basement, and the second largest block of load is in the penthouse where elevator machinery and some air-handling equipment is located. Motors generally have 440-volt nameplates and operate directly off the 277/480-volt system.

In order to make the service installation suitable for the owner's use, it was decided to use metal-enclosed primary switchgear with air break fused switches. The power company provided two incoming feeders—one for standby—and two entrance switches, key-interlocked. A metering cubicle is provided to meter incoming service.

For each outgoing feeder, an air-break switch in separate cubicle is provided. All feeders are radial and no provision was made for selective switching because the power company wishes all load normally to be carried on one of its two feeders with emergency switch-over only to second feeder.



The Bankers Life Company building in Des Moines showing original and added sections.

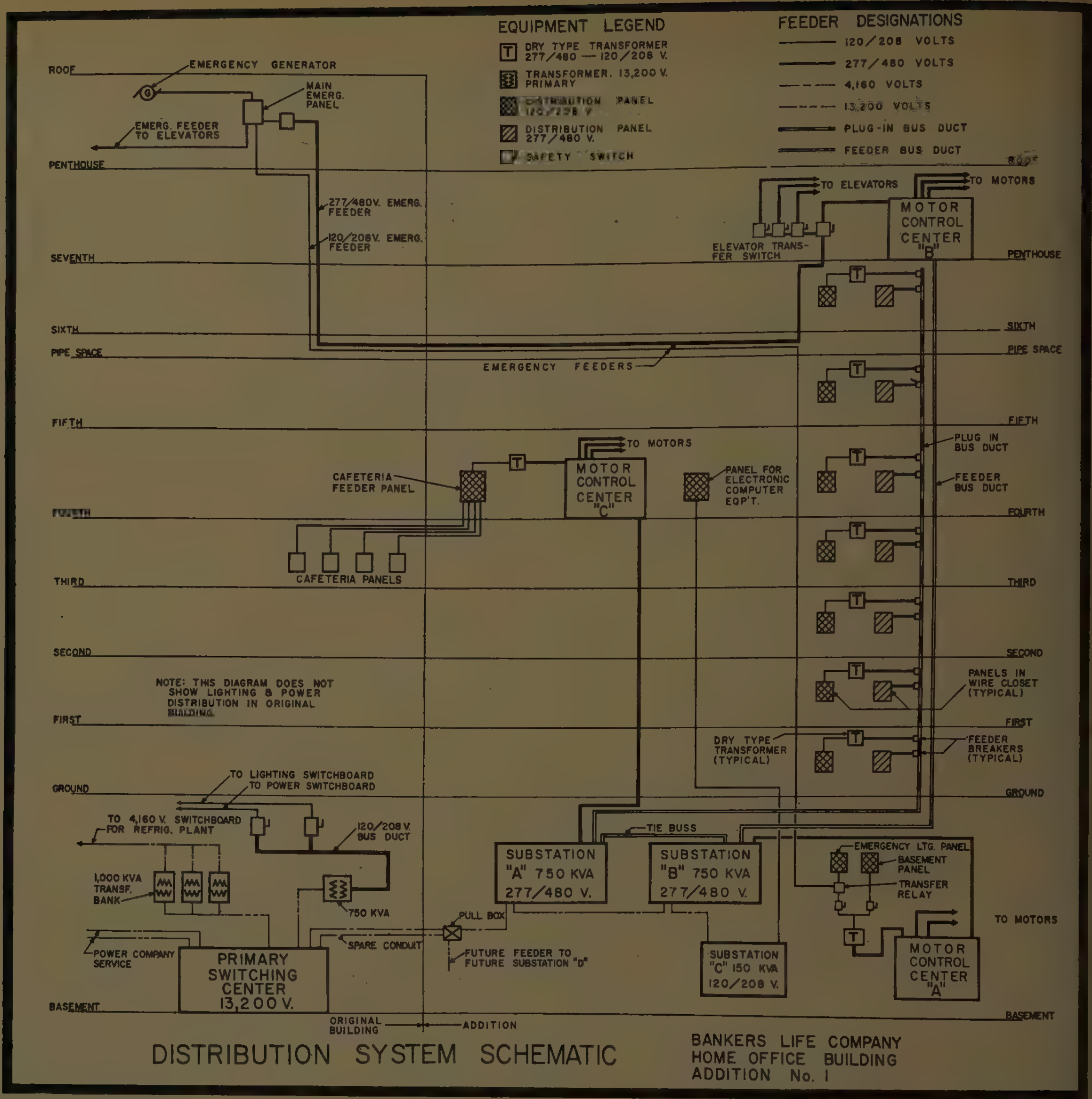
Transformers

To pick up the existing lighting and 208-volt power loads, it was decided to use a single transformer to serve both loads for economy in both cost and space. The existing building loaded a 750-kva transformer practically to capacity. The power company has established as a distribution standard the use of 750-kva network type transformers and keeps a few spares on hand. It was felt that local availability of spare transformers would make it desirable to use this type of transformer.

A second factor influencing selection of transformer equipment in the service vault was the access into the building—by means of a hatchway from grade. It was necessary to enlarge the hatchway slightly to pass the network transformer. This hatchway limitation was also a determining factor in selecting transformer equipment for the 4160-volt air conditioning load.

Three single-phase distribution-type transformers were selected to make up a 1000-kva bank for serving the 4160-volt air conditioning load. These are located in a fenced enclosure in the service vault. Overhead primary buswork is provided with cable connection to the original point of beginning of the 4160-volt service. By keeping all buswork inside the fenced enclosure, it was possible to secure permission from the City Inspection Department to use this construction.

There was a small emergency generator in the existing building which had been used to serve a limited amount of emergency lighting and which was connected for manual switching to permit moving one elevator at a time to the nearest floor in case of power outage. These same functions were desired for the addition. It was not desired to in-



Schematic distribution system of Bankers Life addition showing location of electrical equipment on the various floors.

View shows the two 277/480-volt packaged substations now supplying the new building addition. Substations are I-T-E Transfo-Units.

crease emergency generator capacity or to provide a second generator; hence a feeder was run into the main penthouse of the addition and connected to carry out the stipulated functions.

Because the generator operated at 120/208 volts, it was necessary to transform to 277/480; the transformer was placed near the generator to take advantage of conductor capacity at the higher voltage. The generator starts and picks up the emergency lighting automatically.

Three motor control centers are provided for power distribution and control of the motor loads. These are factory-wired assemblies. The two smaller ones in the penthouses contain such control devices as pilot lights and pushbuttons and serve only the motors in the area where they are located.

The motor control center in the basement operates in conjunction with a separately mounted main control panel.

Conclusions

Economy of buying power at 13.2-kva will be reflected in Bankers Life power costs for years to come. Additional rewards are also evident in the form of highly economical use of space, full flexibility to accommodate future expansion of load, and efficiency through use of packaged substations at load centers.

AT THE HEART OF THINGS

This 20th anniversary of the U. S. Savings Bonds program is an important milestone for the 45,000 companies, large and small, which offer the Payroll Savings Plan to their employees. Payroll Savings is the heart of the bond program, and the means by which millions of families have seen dreams realized since 1941. It has been good for business and industry... good for local communities...good for the nation's economic welfare. Above all it is good for the citizen who sees in each Savings Bond a share in his country's future.

If yours is one of the 45,000 participating companies, this anniversary year offers a good reason for renewed promotion. For help and suggestions, contact your State Savings Bonds Director, or write: **U.S. Savings Bonds Division, Treasury Department, Washington 25, D.C.**

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West Coast Administrators, Sales Executives Discuss Problems, Goals in Recent PCEA Sessions

Administrative Services: Report Management Aids

Manpower management, new accounting procedures, utility economics and related subjects featured the program of the recent two-day joint conference of the Administrative Services of the Pacific Coast Electrical Association and the Pacific Coast Gas Association in San Mateo, Calif.

A recommendation that all utility companies and all employees of utility companies continually and conclusively prove their friendship for their customers was sounded by Walter B. Cosdon, of Washington, D. C., Director of the Southeastern Division of Ebasco Services Incorporated.

Cosdon warned that the New Frontier is on record as deeply dedicated to the interests and welfare of consumers throughout the country.

"The consumers for which they voice concern," he declared, "are electric and gas customers. So it behooves all utilities to constantly demonstrate complete and sincere concern for all their customers, to prove by policies and deeds their lasting friendship for them and for the communities, to create and maintain a reputation as a good corporate citizen."

This, he added, is the duty of everybody in a utility company—the job of every executive and every employee who does or may come in contact with customers either regularly as a company representative on business or occasionally as a neighbor in friendly chats.

In a description of "How To Make Financial Reports And Earnings Statements More Useful To Management," Robert J. O'Brien, Pacific Gas and Electric Co., pointed out that "management's responsibility is to formulate policies and to supervise operations" and added that "exercise of this responsibility requires comprehensive, accurate and prompt statements in comparative form covering all phases of finances and operation." He outlined the PG&E accounting process, wherein on the 10th working day of each month management receives comprehensive reports for the preceding month, three days later receives figures for the cumulative year to date, and about the 25th of the month a balance sheet with detailed schedules of items.

Austin T. Brown, San Diego Electric Company, described a simplified system of accounting for leased transportation equipment. His company adopted a program of leasing new vehicles as company-owned vehicles are replaced or the fleet is expanded by addition.

"The use of one million dollars worth of equipment over the last year has cost the company approximately $100,000 in amortization and $55,000 in interest. About 50 percent of the $55,000 is charged to expense and is tax deductible. The remaining 50 percent is charged to capital through the use of hourly rates. In order to keep management informed of the status of the fleet leasing program, a statement of original value and amortization is prepared each month."

John Havey of the Arizona Public Service Company, identified ways and means to avoid or minimize human errors with electronic computers. In his talk on "Integration of General Accounting Functions Through Use of Electronic Data Processing," he advised:

"In spite of the considerable number of errors that any average group will generate and enter into a computer system, the problem can be kept within bounds by several measures, some remedial and some precautionary.

"First—keep your input forms simple in design. Give the writer of the forms a bare minimum of writ-

(Continued on page 72)

Business Development: Progress in "All-Electric"

Substantial progress in "All-Electric" sales throughout the West was reported at the recent annual conference of the Business Development Section of the Pacific Coast Electrical Association in San Francisco.

The conference attracted more than 200 delegates from all parts of California, Nevada, Arizona, Utah, Oregon, Washington, Hawaii and British Columbia.

Increases in residential sales and prospects of still greater gains were cited in a panel discussion on "Selling All-Electric in 1961." Participants were O. R. Doerr, vice-president, Pacific Gas and Electric Company; T. M. McDaniel, Jr., vice-president, Southern California Edison Company; R. J. Phillips, vice-president, San Diego Gas and Electric Company; Jack Kiedaisch, manager of sales planning and training, Arizona Public Service Company, who represented Don Willis, vice-president of that utility. George C. Tenney was moderator.

Mr. Doerr, spokesman for the largest utility on the panel, announced that during 1960 the average PG&E residential customer increased the use of electricity from 3154 to 3451 kilowatthours—a gain of 297 kwh, or nearly 10 percent, which was the greatest in the company's history.

He presented evidence of the effectiveness of PG&E's efforts to build electrical sales and listed three methods used:

1—Mass education to create interest and develop prospects for purchases of service and appliances.

2—Cooperative dealer programs to benefit the work of thousands of dealer salesmen.

3—Direct contacts by the utility's salesmen.

And he predicted that a continuation of these methods would

A discussion by utility executives on *"Selling All Electric in 1961"* featured this year's conference of the Business Development Section of the Pacific Coast Electrical Association. Members of the panel, left to right, are: Jack Kiedaisch, Arizona Power and Light; T. M. McDaniel, Jr., Southern California Edison; George C. Tenney, moderator; O. R. Doerr, PG&E; R. J. Phillips, San Diego G&E.

bring similar results in 1961.

In amplification, Mr. Doerr said:

"Our mass education program includes normal appliance shows and demonstrations, exhibitions of model homes and our various advertising media.

"Our Light for Living model home program is a good example of mass education. Last year we had 22 such model homes and they were visited by more than 160,000 persons. Members of the Northern California Electrical Bureau and our company contributed to a fund to pay part of the builders' cost of installing the equipment. This payment was up to 2 percent of the total cost of the home.

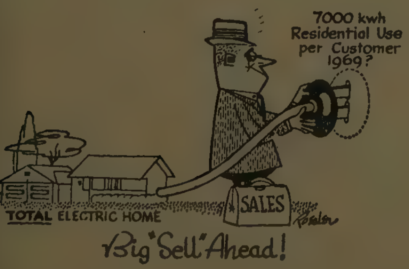
"Our dealer cooperation program includes many specific appliance promotions through the Electrical Bureau, financed by funds contributed by manufacturers, wholesalers and PG&E.

"We are making good progress selling the Medallion Home program to builders through advertising support to sell the homes.

"Another good example of industry cooperation in the sale of Certified Adequate Wiring and Medallion Homes has been provided by the four chapters of the National Electrical Contractors Association in the San Francisco Bay area. As a means of accruing Electrical Industry Funds, each contractor paid 5-cents for every journeyman hour. Through PG&E's efforts the funds were allocated to pay for advertising of homes that were wired according to Medallion or CAW standards."

Mr. Doerr emphasized the need of mass selling to meet the needs of Northern California's population, which averages 1550 per day, and the accompanying gains of industries and commercial businesses.

Mr. McDaniel reported that Southern California Edison Company has made "quite a lot of progress" in selling all electric service in homes and also in commercial establishments. And he cited increases in meters and system load to prove it.


7000 kwh Residential Use per Customer 1969?
TOTAL ELECTRIC HOME
SALES
Big "Sell" Ahead!

He pointed out that Edison's sales plans are designed to meet competition from natural gas and added:

"By All-Electric we mean no gas appliances and we try to eliminate our competition all at once. Instead of trying to sell electric service a piece at a time we concentrate on all electric homes and businesses."

Mr. Kiedaisch exhibited a brochure detailing the Medallion Home program of Arizona Public Service Company and reported increasingly good results from its use.

A question and answer period showed the panelists in general agreement on:

Greater promotion of electric heat, Medallion Home programs for apartment houses, special sales programs for hotels, more extensive campaigns to sell electric water heaters, comprehensive educational projects to inform the public how much the utilities give homes and businesses for their money, and the great potential market for adequate wiring, more appliances and general electrical modernization in existing homes.

John S. C. Ross, manager of residential sales for Pacific Gas and Electric Company, told how "Mass Promotion Pays Off," including a 1960 mass promotion pay off of $342,258,000 in PG&E's service area in Northern and Central California. This total included $272,000,000 worth of appliance sales, $68,000,000 worth of plant installations for the utility and $2,258,000 worth of wiring and installation work on customers' premises.

This, he stated, was a dramatic demonstration of the effectiveness of mass promotion because, "while the appliance business throughout the country was down compared to 1959, in our area it was better than the previous year."

He explained, "In Northern and Central California we enjoy a high degree of industry cooperation, in which the promotional activity is coordinated through the Northern California Electrical Bureau. PG&E does no direct merchandising, consequently we must depend on other means of influencing customers and prospective customers to buy electrical goods, and we use mass promotion.

"Our Electrical Bureau consists of a central body with headquarters in San Francisco. The members include 42 manufacturers, 197 distributors, 2451 retailers and several hundred contractors. This body:

"1—Gathers promotional funds, about two thirds of which come from the utility.

"2—Plans promotional campaigns and programs in cooperation with the utilitys' general office staff. These campaigns and programs are put into operation at the retail level by 33 local groups of retailers, known as retail units of the Bureau. In each unit a PG&E representative acts as secretary and does the leg work to implement the mass promotion. Through the Bureau and its 33 local units the interest, sales effort, manpower, funds and promotional campaigns of our industry are coordinated and brought to bear on our potential market."

ing to do. Design your forms with consideration for the person who will fill them out and whoever will convert the information to your computer's input medium.

"Second — conduct an extensive and continuous educational program. Money spent on employee education in the field is definitely a better investment than a like amount spent on extra clerical work and unityping to correct input errors.

"Third — have your computer screen your input data for invalid values and combinations of keys and codes."

Paul H. Murdoch, assistant comptroller of Southern California Edison Company, in a talk on "Integrating Quality Control With Cost Control," declared: "Work Simplification is a good route to Quality Control and Cost Control — since most people don't like to work and few even know how."

He explained that Edison is experimenting with Work Simplification and added:

"There is immeasurable waste of time and energy and material in doing a job and the attending lack of interest breeds suspicion or even downright resentment of any form of change.

"A capsule procedure for Work Simplification would run something like this:

"1—Select for improvement a job giving the most trouble.

"2—Get the facts, from which you should make a flow chart listing all details.

"3—Challenge every detail and list the possibilities for improvement.

"4—Develop better methods.

"5—Install improvements.

"Our comptroller's department has a standing committee of four second-level supervisors and a third-level supervisor as chairman, to pass upon all suggestions for Work Simplification. Working with them is a sub-committee of four employees — the supervisor of our Accounting Procedures Division, the supervisor of our Machine Procedures Division and one employee from each of those divisions who has been educated in Work Simplification."

Mr. Murdoch cited Statistical Sampling as the second route on which Edison has embarked and he outlined its application in internal audit procedures:

"It was decided that the two areas where most of our audit time was being spent were (1) the review of our meter order forms encompassing such transactions as turn-ons, turn-offs, meter changes, meter tests, corrections, load check and practically everything that can happen to an account and (2) the billing history form which is prepared on any account where historical value has any significance.

"It had to be recognized and accepted that 100 percent accuracy cannot be attained in any sampling technique. However, once the specific degree of error to be tolerated has been established, the possibility of a larger error can be definitely determined, based on the construction of the sample. In other words, a sample can be set up to virtually guarantee that the established standards of allowable error will be met.

"In developing specific statistical auditing procedure, we decided that a 2 percent error would be allowable and that the degree of accuracy was required at least 95 percent of the time."

As to Quality Control, Mr. Murdoch asserted:

"It is a matter of supervision. Selection of proper personnel is the first step in looking for it, and this coupled with training and the proper tools should give overall Quality Control and Cost Control," he concluded.

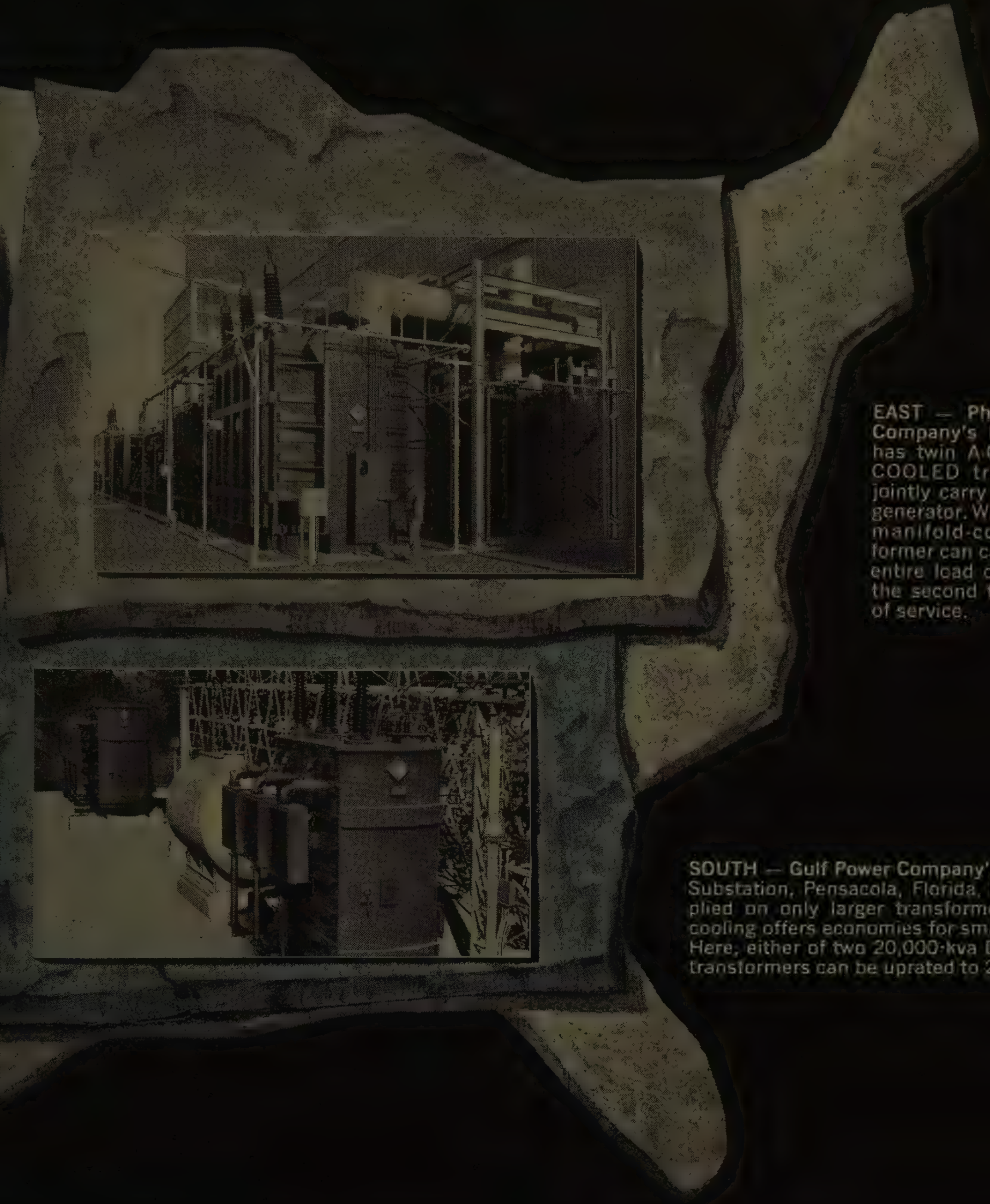
Frank F. Bradshaw of General Electric Company's Management Center at Ossining, New York, emphasized that managing business today requires that personnel be treated as an investment rather than as an expense and given the same foresighted control now commonly found only in the management of technology and finance. He explained:

"At the same time that investment in new equipment and automation is planned, funds for retraining and reassigning employees will be provided and viewed similarly as an investment contributing to the assets of the business.

"Failure to view the entire resources of a business enterprise on the same mathematical perspective — including employee competence and morale, public relations and customer goodwill, product research and development—frequently has influenced management toward sacrificing the long run vitality and survival of an organization to the immediate gains in tangible results appearing in current operating statements."

General Electric Company's efforts to keep its personnel abreast of "the greatest changes in the history of mankind" were described by Moorhead Wright, director of GE's Advanced Management Institute at Crotonsville, New York. He declared that the major work at the Institute is "to alert managers to learn to see trends and variations and to imagine what they mean, so, being in positions of leadership, they can change directions and methods to do the best possible job."

In another recent West Coast meeting (held in Portland, Oregon; reported in EL&P, June 1, p. 45), this group engaged in a panel discussion of purchasing and stores matters. Presiding at the NELPA session is PG&E's A. H. Skillin (center), who is chairman of the committee.



EAST — **Philadelphia Electric Company's** Eddystone Station has twin A-C 200-mva DUAL-COOLED transformers that jointly carry the output of one generator. With inter-connected manifold-cooling, one transformer can carry practically the entire load of the generator if the second transformer is out of service.

SOUTH — **Gulf Power Company's** Bayou Chico Substation, Pensacola, Florida. Previously applied on only larger transformers, A-C dual cooling offers economies for smaller units too. Here, either of two 20,000-kva DUAL-COOLED transformers can be uprated to 26,667 kva.

DUAL-COOLED transformers boost emergency capacity without loss of life! Throughout the nation more and more utilities are turning to DUAL-COOLED transformers as an economical new way to get central station and substation emergency capacity. DUAL-COOLED transformers—an Allis-Chalmers development —utilize a bank of two or more transformers. During an emergency, while one transformer is off the line, ts cooling equipment is connected to the functioning transformers. Result: Capacity of any DUAL-COOLED ransformer can be increased over its normal rating. *Dual-Cooled transformers is an Allis-Chalmers trademark.* A-1468

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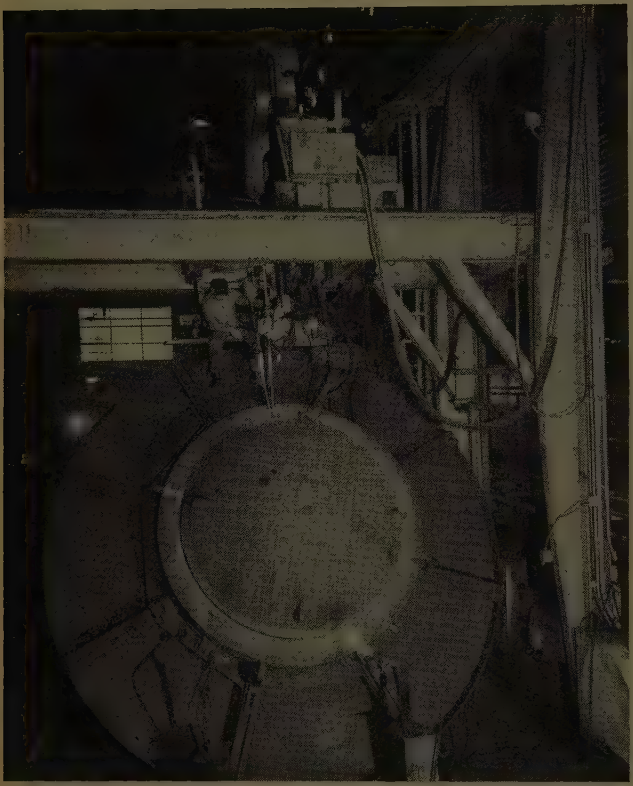
MANUFACTURERS-PRODUCTS

Hard Hat For A Reactor Pressure Vessel



This head for a nuclear reactor pressure vessel is being fabricated at the Allis-Chalmers West Allis (Wis.) Works.
Torches are used to preheat the welding preparation to 200-300 F for the carbon steel welding. The joint is slow-cooled after welding and inspected by radiograph. This pressure vessel is for the Pathfinder reactor, first to contain a nuclear superheater integral with the power reactor. When placed in operation in 1962, this nuclear plant will add 66,000 kw to the Northern States Power Co. System.

S-P To Produce Medium-Duty Diesel Trucks

Studebaker-Packard Corp. is producing the first line of medium-duty trucks equipped with basic, unconverted diesel engines on the U.S. market, according to L. E. Minkel, vice president of marketing.

Mr. Minkel said, "Their introduction is the result of substantial market research which shows an immediate and growing demand for medium-duty diesel trucks." They will be rated at 19,500 and 23,000 lbs gross vehicle wt, and will carry loads of 15,500 and 18,000 lbs, respectively. The diesel power plants will be 4-53, four-cylinder engines manufactured by Detroit Diesel. This engine has been used to convert hundreds of medium-duty, gasoline-powered trucks to diesel for both over-the-road and pickup and delivery operations.

Advantages of these engines are exceptionally low cost operation, proved dependability, low maintenance costs, S-P reports.

Vacuum Steel To Be Used In Rotor Forgings

Bethlehem Steel Co. will produce turbine rotor and spindle forgings from vacuum steel in the future. Bethlehem does not intend to increase the price of the forgings from vacuum-cast steel.

Bethlehem claims that experience with hardened-steel rolls has proved the superiority of vacuum-cast forgings subject to unusual service requirements over those made from air-cast steel. During the past several years this company has made a number of steam turbine-generator shaft forgings from vacuum-cast steel with outstanding improvement in quality.

Through vacuum casting the volume of hydrogen and other gases in the ingot are reduced to a harmlessly low level. In Bethlehem's vacuum-pouring process, steel melted in the electric furnace is poured either into a pony ladle at the top of the vacuum-pouring unit into an ingot mold, or from the furnace ladle into a second ladle contained in the vacuum tank. Steel flows from the ladle through a high vacuum in the degassing chamber. The flow is actually spray in contrast to the tight rope-like stream of the air-cast ingot. The disintegration of the hot metal into small droplets releases the hydrogen as well as other gases.

This 116-ton, vacuum-cast steel shaft is for G-E's generator unit to be installed on the Tennessee Valley Authority System. The shaft was forged from a 120-in. diameter, 260-ton ingot, the largest ingot ever cast in a vacuum by Bethlehem Steel.

MEN OF POWER

Woodzell

Stephen R. Woodzell, formerly assistant manager of Potomac Electric Company's electric system, has been appointed manager, electric system, succeeding **George C. McCabe,** vice president - manager electric system, who is retiring. Mr. Woodzell had held his former post since 1957, except for a short period during which he directed activities of the meter department. He is a member of AIEE and serves on the Electrical System and Equipment Committee of EEI.

* * *

Charles H. Alban, chief structural design engineer for Commonwealth Services Inc., has been elected a director of that organization. He replaces **Howard W. Slack** who has retired.

* * *

Kigar

Donald F. Kigar, vice president in charge of Union Relations for Detroit Edison Company, has been elected executive vice president, to take office September 1 upon the retirement of **Charles R. Landrigan.** Mr. Kigar was manager of construction prior o his present position and became a vice president in 1957. Mr. Landrigan has been with the utility since 912 and executive vice president ince 1954.

* * *

Clarence A. Dauber, director of The Cleveland Electric Illuminatng Company's Civil and Mechanial Engineering Division, will head he thermal power engineering acivities of Chas. T. Main, Inc., Boson consulting firm, as of July 1. Mr. Dauber has been with CEI ince 1928, holding several execuive posts, including that of supervisor of plant design, prior to appointment to his present position in 1953.

* * *

Bennett

Rear Admiral Rawson Bennett (USN Ret.), formerly Chief of Naval Research, has been elected a senior vice president of Sangamo Electric Company. He will serve as director of engineering. Admiral Bennett has had a prominent career in Naval engineering and electronics, having served as Head of the Electronics Design Division of the Bureau of Ships during World War II; Director of the Navy Electronics Laboratory 1946-50; Director, Electronics Production Resources Agency 1950-51; Mine Warfare Branch, Bureau of Ships 1951-53; and Assistant Chief, Bureau of Ships (electronics) 1954-56. He became Chief of Naval Research in 1956.

* * *

F. R. McMeekin, vice president in charge of operations for the South Carolina Electric & Gas Company, has been named vice president and general manager of the company. He is also a director and member of the executive committee. **Arthur Williams, Jr.,** vice president and staff counsel, was advanced to senior vice president with additional supervision of public relations and other special assignments. **George L. Dibble,** manager of engineering, production and transmission, and also a company director, has been named vice president in charge of electric operations and engineering.

Gerald V. Keeley, employment supervisor of Central Illinois Public Service Company since 1958, has been appointed manager of a newly-created Public Affairs Department. He will work directly with **M. S. Luthringer,** company president, analyzing and advising management on legislative matters, and developing programs and plans relating to matters of interest to the company, its investors, and employees.

* * *

Interstate Power Company directors elected two new vice-presidents last month. They are **Robert W. Steele,** former assistant to the president, and **Oscar Solberg,** secretary and treasurer.

* * *

B. H. Boatner, president of Westinghouse Electric Supply Company, has been elected president of the National Association of Electrical Distributors for the year ahead. He will also serve as chairman of the executive committee and the board of governors.

* * *

Robert H. Willis, vice president of Stone & Webster, Inc., has been elected president of Jamaica Public Service Limited, a subsidiary. He has been serving JPS as financial advisor.

* * *

Robert E. McIlvane, manager of communications cable sales for Anaconda Wire and Cable Company, has been named manager of the Communications Products Division.

* * *

A. D. Caskey, assistant manager of engineering for Commonwealth Edison system, retired May 1 after 40 years with the system.

* * *

Donald E. Young, assistant to the president of Burroughs Corporation, has been elected assistant vice president - general.

New vice presidents of South Carolina Electric & Gas Co., are: from left, S. C. McMeekin, A. M. Williams, and G. L. Dibble.

Bashlin's Quality

FOR OVER 30 YEARS

TOOLS OF SAFETY . . .

BASHLIN Quality Body Belts with the additional Nylon Safety Feature . . . Work Safely . . . Comfortably . . . with tools in easy reach.

BASHLIN Quality Alcoa Aluminum Alloy Adjustable Climbers with replaceable gaffs . . . There is nothing better anywhere!

BASHLIN'S Nylon and leather Safety Straps . . . Bashlin Quality, of course.

You Can't Afford Anything LESS Than the BEST—

Buy BASHLIN

Highest Quality For Over 30 Years

Distributors in Strategic Areas in U.S.A.

EXPORT: Copperweld Steel International Co.
IN CANADA: A. B. Chance Co. of Canada, Ltd., Toronto

Ask for . . .
CATALOG NO. 456

W. M. BASHLIN CO.
GROVE CITY, PA.

SUPPLY FACILITIES

English Electric Forms U. S. Company

The English Electric Corp. has incorporated in the U. S. to consolidate activities of the English Electric Export and Trading Co., Marconi's Wireless Telegraph Co., Marconi Instruments and the English Electric Valve Co.—all of which have been represented here for 10 years or more.

President of the Corp. is E. S. Dean, who has been English Electric's Group representative in the U. S. since 1949. Executive vice-president in Alan Barraclough, who has headed the English Electric Export and Trading Co. in the U. S. since 1952.

English Electric's largest contract so far in the U. S. was for ten 83-mw hydraulic turbine-generating units and five 183-mva transformers for Priest Rapids Dam in Washington State.

New Press For Lighting Fixtures

Higher quality final products, quicker manufacturing times, better use of material and improved designs are being realized according to Westinghouse Electric Corporation's lighting division due to installation of a new press in their Vicksburg, Miss., plant.

Claimed to be the largest press in the lighting industry, the 600-ton Verson straight-side press was put into operation recently so that parts for new, larger lighting fixtures could be made to high-quality standards and at mass production rates.

Since the big machine usually requires only one stroke to do its job, it can produce parts more accurately and at a much faster rate than can smaller presses, Westinghouse announced. The machine can form metal having a thickness of up to one-half in. It operates at speeds up to 18 strokes per minute.

The new press also allows designers to specify innovations which were previously impractical or impossible to incorporate into a lighting fixture. Some of the products now benefiting from the new press are fluorescent commercial recessed luminaires and the fluorescent interior fixtures.

New Digital Electronics Co.

Advanced Scientific Instruments, Inc., a new company specializing in digital electronics, has made its debut in Minneapolis. They will develop advanced digital and analog computing instruments and components. Laboratories and offices are located at 5249 Hanson Court, Crystal Industrial Park, Minneapolis 22, Minn.

Officers of the new firm are: Jules Ebin, board chairman; Morris B. Ebin, vice chairman and treasurer; Francis J. Alterman, president; Ralph E. Mueller, executive vice president; Samuel H. Maslon, secretary.

Onan Opens New Technical Center

Expanded research and testing facilities to speed up study of fuel cells and transistorized invertors have been set up by the Onan division of Studebaker-Packard Corp. in a new 15,000-sq ft Technical Center just opened in Minneapolis. New laboratories for the development and testing of electric generators and for research into fuel cells, and a new radio noise-free screen room, have been set up under the supervision of James C. Hoiby, engineering vice president.

This is the new 15,000-sq ft Technical Center recently opened in Minneapolis by the Onan division of Studebaker-Packard Corp. The center combines production and development engineering groups, associated laboratories and a service department training center. Work areas have an illumination level of 200-ft-c.

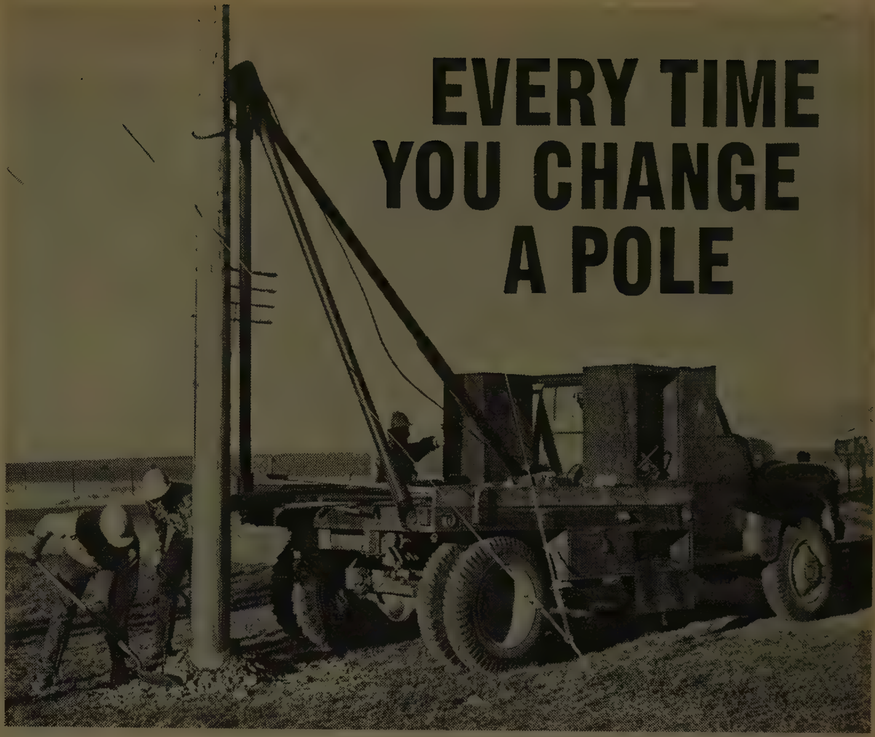
Potential Device

Potential device for monitoring voltages in 23 to 161-kv ranges by **S&C Electric Co.** replaces conventional potential transformers and is said to cost 65% less than comparable potential transformers. This high-voltage, oil-immersed resistor provides up to 3.5 milliamps as a direct function of line-to-ground voltage. Manufacturer states that, with suitable accessories, the potential device can sense voltage for automatic switching; detect grounds, indicate voltages through indicating lamps or meter instruments, supply potential for certain relays, and charge batteries.

Circle item #1 on reply card

Extra-Wide Roadway Luminaire

Roadway lighting luminaire (OV-50 Silverliner) for 700- and 1000-w clear- and color-corrected mercury lamps is available from **Westinghouse Electric Corp.** Specially designed for extra-wide roadway



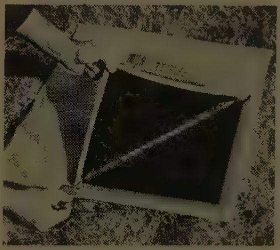
EVERY TIME YOU CHANGE A POLE

Protect it with a POL-NU® PAK

When a pole is removed from one location and re-set in new earth it is subject to rapid decay and insect attack at the critical ground-line area. Renewal of preservative protection is vital to obtain longest possible service life.

The Chapman Pol-Nu Pak makes it easy for line crews to apply ground-line preservative to "road-moves" and poles being returned to service. It is an envelope-type bandage containing Chapman Pol-Nu, grease-type preservative which gives long-lasting protection.

Pol-Nu Paks are available in several sizes and, because of their convenience, are often preferred for down-the-line treatment of standing poles. Factory sealing of the Pak always insures the proper amount of preservative application for maximum protection without waste. The photos below show how easily it is applied. Mail coupon for data.



Slit Pol-Nu Pak on three sides to expose preservative.

Wrap bandage around pole at ground-line and staple.

Back-filling completes job, assuring longer pole life.

CHAPMAN CHEMICAL COMPANY
Leading manufacturer of wood preservatives • Memphis 1, Tenn.

CHAPMAN®
POL-NU
PAK

MAIL COUPON FOR COMPLETE DATA
Chapman Chemical Company
P. O. Box 138, Memphis 1, Tenn.

Please send data on the Pol-Nu Pak to:

Name ____________
Company ____________
Address ____________

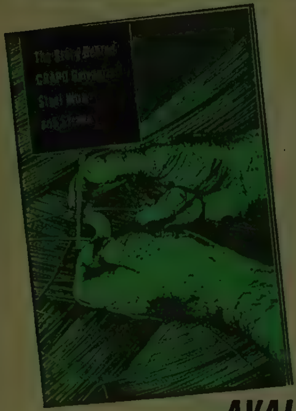
Crapo GALVANIZED STEEL STRAND

Mandrel Test*

Checked and Double-Checked by Laboratory Technicians

Every coil of wire used in the manufacture of *Crapo* Galvanized Steel Strand is tested and approved by trained laboratory technicians. Samples from both ends of each individual coil are subjected to a series of prescribed tests before stranding. Then, the finished strand is re-checked to make certain that it conforms in every respect to established specifications and our own high quality standards.

Thus you know when you specify *Crapo* Galvanized Strand that every precaution has been taken to assure maximum performance in the finished product.



Write for Free Booklet

"The Story Behind **Crapo** Galvanized Wire and Strand" illustrating and describing manufacturing techniques and testing procedures. Ask for Booklet B-59!

AVAILABLE IN 3 COATING WEIGHTS

FOR GUYS, MESSENGER AND OVERHEAD-GROUND WIRE

Crapo Steel Strand is available in all standard sizes and grades and in Class A, B and C galvanized coatings. Class B coating is twice as heavy as Class A coating; Class C coating is three times as heavy.

INDIANA STEEL & WIRE CO., INC.
Muncie, Indiana

*Determines ductility of wire and adherent quality of galvanizing.

NEW PRODUCTS . . .

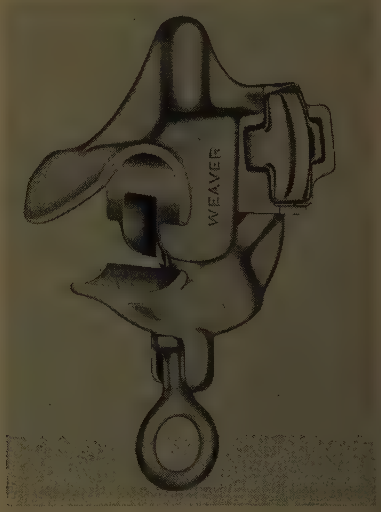
(*Continued*)

which have heavy traffic density, it also has application in parking lots and shopping plazas. Unique latch allows easy access to lamp and provides tight seal to keep out bugs, dirt, and moisture. Textured aluminum finish resists heat, abrasion and corrosion.

Circle item #2 on reply card

Hot Line Clamp

Aluminum hot line clamp by **J. A. Weaver Co.** is tightened by the lever and fulcrum principle rather than usual bolt-and-slider method. Clamp is bell-mouthed and wire-bearing surfaces are machined to avoid damage to conductor. It has a long contact area . . . the maximum length that can be effectively tightened with a single bolt. A heavy spring assures constant pressure on conductor. When clamp is open, saddle drops out of the way for easier installation.



Circle item #3 on reply card

Trash Rake

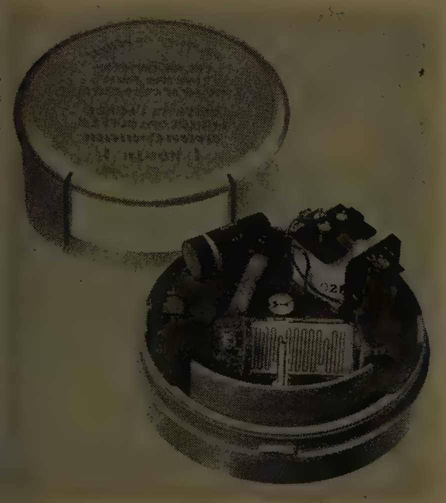
Trash rake (Type B) by **Allis-Chalmers** has dual hoisting mechanism that controls tooth action for digging or dislodging debris at any point on the trash racks. One hoist governs entire movable portion of unit and other positions the teeth. Rake and teeth can be lowered and adjusted simultaneously to provide teeth with digging action. Where heavy debris is encountered in

water intake, rake can be lowered so teeth penetrate debris and tear it apart. Rake is available in sizes from 4 to 12 ft in 2-ft increments.

Circle item #4 on reply card

Photoelectric Control

"Quick Response" photoelectric control by **General Electric Co.** is designed for outdoor lighting applications. Photoelectric cell is combined with a new, simplified circuit and a minimum of components to assure reliability and trouble-free operation. The control will fit all NEMA-EEI receptacles on luminaires and associated devices and will switch up to 1000 w incandescent load or 1800 v-amp mercury vapor or fluorescent load. It has an operating range of 0.5 to 3.0 ft-c, and is available for either 120- or 240-v operation.



Circle item #5 on reply card

THE CONNECTING LINK

PURCHASER
SALES
MANUFACTURER
REPRESENTATIVE

The SALES REPRESENTATIVE serves as a connecting link between the PURCHASER and the MANUFACTURER. The qualified rep is well informed concerning the customer's requirements and thoroughly familiar with the manufacturer's products. The rep's function of properly fitting together needs and products benefits all concerned.

The PURCHASER gains product application, quotation and expediting service. Also just and forthright handling of adjustments.

The MANUFACTURER gains a capable and efficient marketing organization at a predetermined low sales cost. The numerous contacts of each rep's sales personnel are especially valuable.

ELECTRICAL EQUIPMENT REPRESENTATIVES ASSOCIATION, founded in 1948, is dedicated to BETTER SELLING and SERVICE. Its members are ambitious to improve their performances and to benefit by the interchange of experiences and ideas with others in the same line of work.

Send for EERA Directory, listing the members, accounts handled and territories covered. It's free.

EERA, 1675 Fifth St., Clermont, Fla.

EERA

ELECTRICAL EQUIPMENT
REPRESENTATIVES ASSOCIATION

FOUND!

How To Keep Street Lights Burning

Take a simple, lightweight, compact photo control. Use Varistors in conjunction with the secondary lightning arrester.

RESULT: You eliminate the one biggest cause of photo control failure... transient voltage surges which are *below* the spark-over of lightning arresters.

That's LUMATROL MARK I...completely reliable! It withstands ALL transients up through the capability of the secondary arrester!

WRITE FOR BULLETIN 91a.
MICRO BALANCING, INC.
GARDEN CITY PARK, N.Y.
In Canada: J. R. KEARNEY CORP.
Box 270, Guelph, Ont.

INTRODUCING THE NEW
DRYDEN-EAST
HOTEL
39th St., East of Lexington Ave.
NEW YORK

Salon-size rooms • Terraces • New appointments, newly decorated • New 21" color TV • FM radio • New controlled air conditioning • New extension phones in bathroom • New private cocktail bar • Choice East Side, midtown area • A new concept of service. Prompt, pleasant, unobtrusive.

Single $15 to $22 Suites to $60
Special rates by the month or lease

Robert Sarason, General Manager
ORegon 9-3900
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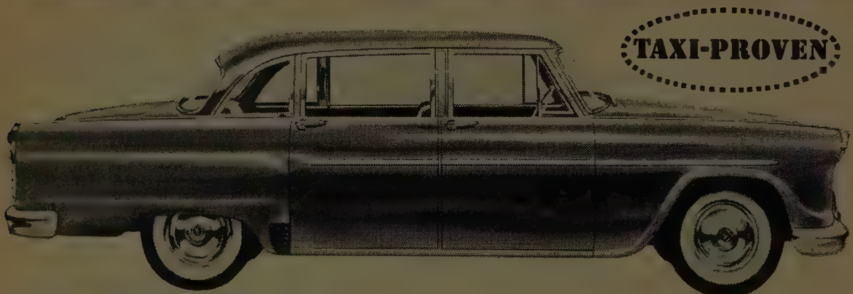
Who says they don't build 'em like they used to any more?



CHECKER does!

And from the ground up. It's actually *hard* to wear out a Checker fleet car. After 150,000 miles . . . even at 200,000 miles of payload operation, a Checker is still going strong. Gas usage is gratifyingly low, maintenance costs are minimum and repair bills are few and far between. At Checker, we still build 'em like we used to . . . only better.

Shouldn't you check into CHECKER? Write DEPT. 44

CHECKER MOTORS CORPORATION
KALAMAZOO, MICHIGAN

Current—Sensing Relay

Current-sensing relays (COD) from **Westinghouse Electric Corp.** have independently adjustable high and low-current stationary contacts for switching and control operations. They are available with either tapped or non-tapped electromagnets. Tapped relays are supplied in following ranges: 0.5 to 2.5, 2 to 6, and 4 to 12 amp ac. Non-tapped units are available with a range of 0.5 to 2.0, or 1.5 to 6 amp ac. Moving contact of relay assumes a position corresponding to the current applied and will remain in that position until current changes to some other value.

Circle item #6 on reply card

Square Panel Fluorescent Lamp

Square panel fluorescent lamps by **General Electric Co.** are 11⅝ in. square by ½ in. deep. Rated at either 80 or 50 w, manufacturer claims that lamp emits 4800 lumens at 80 w and 2900 lumens at 50 w. 50% of light is emitted from front and 50% from back. Base terminals

are recessed at corners behind one rim of lamp, within overall lamp dimensions, for use with push-pull electrical connections. Average brightness is 3200 footlamberts at 80 w and proportional to lumen output at 50 w. Life is claimed to be 7500 hr at either wattage. Waffle design face plate has 1¾ in. glass squares. Color is cool white and starting is rapid.

Circle item #7 on reply card

Multipurpose Insulator

Multipurpose insulator is available by **Lapp Insulator Company**. Strut insulators consist of solid, Vacuum Process porcelain post or rod, in Fog Type design with galvanized, malleable iron caps cemented on the ends. The 6-in. diameter units are available in five lengths with striking distances of 17, 23, 28, 31 and 34 in. for use singly or in combinations. Struts are self-supporting, puncture proof, resistant to contamination and free from radio and television interference.

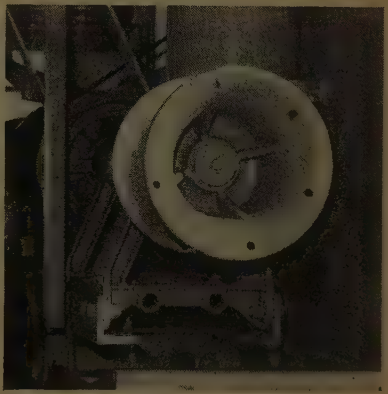
Circle item #8 on reply card

Two-Way Radio Towers

Two-way radio communications towers ranging in height from 10 to 500 ft by **Motorola** include eight bolted or welded guyed towers and one self-supporting model. Five of guyed towers are bolted, tubular steel construction 130 to 440 ft high. Two other guyed towers are con-

TULSA®

This International R-190 truck uses a model 34 Tulsa Winch operating with a hydraulic boom. The truck is one of the 2,850 vehicles used by the Southern California Edison Company to service more than 20,000 square miles in the Southern California area.



strength & stamina that spell savings

There's more room for pay load because a Tulsa Winch is compactly designed. This winch packs a terrific pull even though weight has been trimmed to the bone. More shock load is absorbed, and more operating efficiency is delivered by Tulsa's specially designed worm and gear. You have less engine wear and lower fuel bills since you use less horsepower to move a given load. Longer life for cable or wire is provided by a larger size and machined drum barrel.

Tulsa's easily installed front mounted winches assure better weight distribution and steering for the vehicle — and safer off-highway operation — because there's a minimum of overhang.

WRITE for special Public Utility bulletin CUV-58.

TULSA PRODUCTS DIVISION

VICKERS INCORPORATED, DIVISION OF SPERRY RAND CORPORATION

731 EAST 1ST ST. TULSA, OKLAHOMA

E-403

3 WAY EMERGENCY COMBINATION
All in one handy portable unit

Searchlite Floodlite
and
FLASHING RED WARNING LIGHT

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SPOTLIGHT
operates from vehicle or portable battery.

Red Warning Light for emergency vehicles
Permanent and Demountable Types
●
Also other types

Send coupon for information and free trial offer. No. 26
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THE PORTABLE LIGHT CO., Inc.
63 PASSAIC AVENUE - KEARNY, N. J.

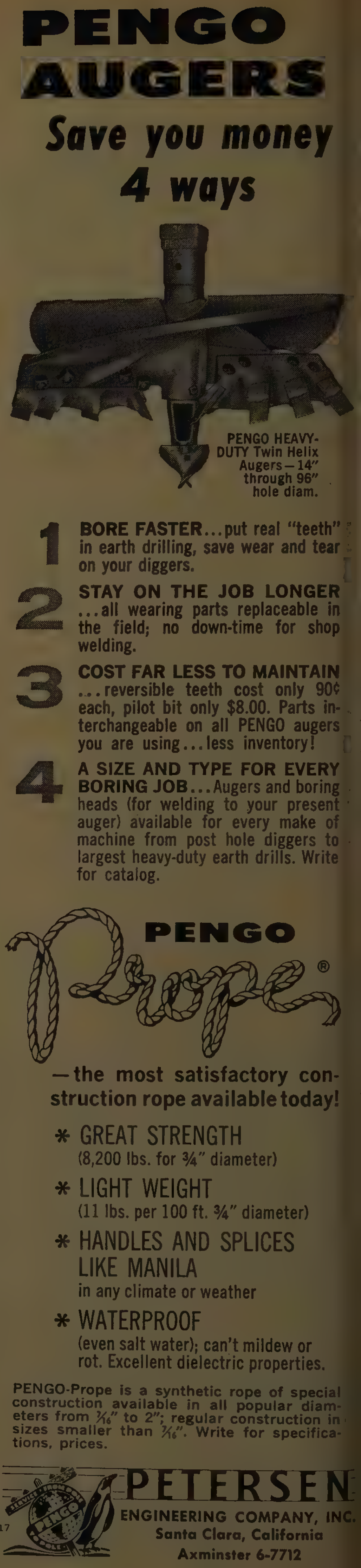
structured of welded solid steel cross-braces on tubular legs with heights of 150 and 200 ft. All towers have windload rating of 30 lb per sq ft. Self-supporting tower has maximum height of 120 ft.

Circle item #9 on reply card

Lightning Arresters

Distribution-class, valve-type, lightning arresters that afford improvement in apparatus protection are available from **Line Material Industries.** Designated Type E5 direct connected and T5 externally gapped, they are available in standard voltage ratings of 1 through 20 kv. They are said to be stable and to have consistent sparkover characteristics, low discharge voltage characteristics, and compact size and rugged construction. Permanent moistureproof seals prevent internal contamination and radio interference.

Circle item #10 on reply card



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Save you money 4 ways

PENGO HEAVY-DUTY Twin Helix Augers—14" through 96" hole diam.

1 **BORE FASTER**...put real "teeth" in earth drilling, save wear and tear on your diggers.
2 **STAY ON THE JOB LONGER**...all wearing parts replaceable in the field; no down-time for shop welding.
3 **COST FAR LESS TO MAINTAIN**...reversible teeth cost only 90¢ each, pilot bit only $8.00. Parts interchangeable on all PENGO augers you are using...less inventory!
4 **A SIZE AND TYPE FOR EVERY BORING JOB**...Augers and boring heads (for welding to your present auger) available for every make of machine from post hole diggers to largest heavy-duty earth drills. Write for catalog.

PENGO Prope®
—the most satisfactory construction rope available today!

- ✱ GREAT STRENGTH (8,200 lbs. for ¾" diameter)
- ✱ LIGHT WEIGHT (11 lbs. per 100 ft. ¾" diameter)
- ✱ HANDLES AND SPLICES LIKE MANILA in any climate or weather
- ✱ WATERPROOF (even salt water); can't mildew or rot. Excellent dielectric properties.

PENGO-Prope is a synthetic rope of special construction available in all popular diameters from 5/16" to 2"; regular construction in sizes smaller than 5/16". Write for specifications, prices.

17
PETERSEN ENGINEERING COMPANY, INC.
Santa Clara, California
Axminster 6-7712

Public-Private *Cont. from p. 53*

But, there were many voices shouting out for the interests of public power. Example: About the hydro aspects of the proposed Delaware River Basin Compact, APPA's Gen. Mgr. Alex Radin complained to Pres. Kennedy that such provisions "are contrary to long-established, fundamental Federal government policies . . . and do not adequately protect the interests of consumers served by municipal electric systems," REA co-ops or the Federal government. The APPA spokesman expressed misgivings about the "partnership" approach and the absence of the "traditional" preference clause.

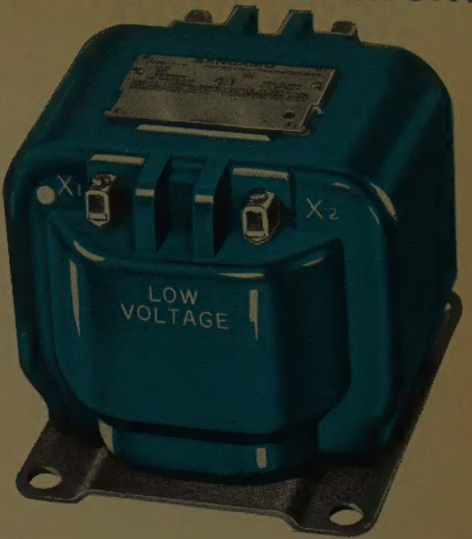
If this was a limitation on the co-ops, another Federal government agency took steps, in policy at least, to remove "limitations." REA Administrator Clapp is now on record as "opposed to any power contracts which call for dual rates or any other type of limitation aimed at denying a cooperative any legitimate consumer." He adds: "If a co-op can't get a fair contract, we are going to look at the possibilities of generation." How does REA see a "fair contract?"—Delivery of "adequate power" from wholesalers at "reasonable rates" with provision of "necessary guarantees that these benefits cannot be withdrawn at the whim of an unfriendly supplier."

And, there were other examples: About opposition to Burns Creek, Reclamation Commissioner Dominy said: This is the same attitude that hindered Hoover, Shasta, Grand Coulee and Yellowtail. He told the Wyoming audience, "Some of you may have been misled by a fraudulent bill of particulars put together by some segments of the private power industry—an industry which has long cried gloom and doom concerning Federal hydropower development."

About the nation's atomic power "partnership" program, Chet Holinsfield, chairman of the Joint Congressional Committee on Atomic Energy charged: "It has delayed the development of atomic power and allowed the privately owned utilities to dominate a program largely financed with public funds." Hail-

AVAILABLE NOW FROM SANGAMO...

the smallest, lightest T-6 potential transformer of its kind



First the BH-6 current transformer . . . and now, a companion potential transformer—the T-6. Compact, epoxy-molded and encapsulated for indoor-outdoor 600 volt class service. Accuracy classification is 0.3 at W and X burdens; actually, the design allows 0.3 accuracy for burdens of two watthour meters, phase-shifting transformer, and demand register (approximately 35 volt amperes).

Impulse level of the T-6 is well in excess of 10 kv full wave, yet it weighs less than 14½ pounds. Liberal cross-section in the secondary winding accounts for a thermal burden rating of 500 volt amperes at 30°C ambient.

The T-6 is small. It measures only 5¾" x 5¼" x 4½". Standard ratios are completely color-coded as follows: 2:1, red, 2.5:1, yellow, 4:1, blue, 5:1, gray. It's built to last, too . . . right down to its alondined and painted aluminum base. Naturally, it meets all of the applicable NEMA standards for indoor transformers of the 600 volt class.

Our suggestion: check full particulars of the T-6 with your Sangamo Representative.

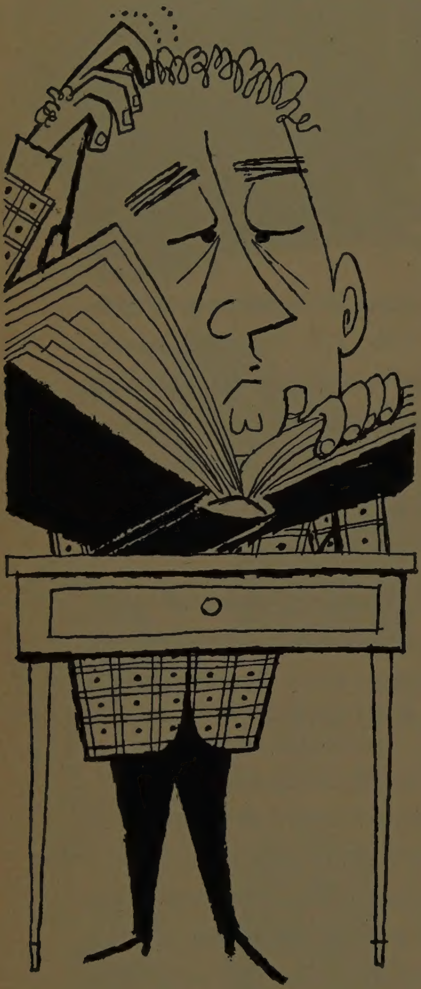
Sangamo BH-6 current transformers lead their class, too. Use them . . . take full advantage of their dual-range feature (a Sangamo first). Eliminate transformer changeouts due to load growth.

BH-6 transformers are epoxy-molded, color-coded, completely encapsulated, lightweight. Large conductor goes through that *Big Hole* easily. Available for all indoor or outdoor applications in a rating for your specific need.

SANGAMO ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

PX61-1

Searching for Enclosures?



look to . . .
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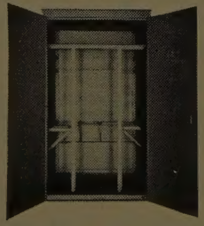

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Write for a free Catalog outlining types and sizes of enclosures, reactiformers, test switches, test blocks, and meter socket equipment.

ing the plan to convert the Hanford reactor to dual-purpose operation, the Joint Committee chief sees the future role of "partnership in nuclear power" only as a supplement to a "strong" Federal role.

But, to investor-owned utility management, "the Hanford reactor represents retrogression rather than progress." That's the way EEI Pres. Sherman R. Knapp put it in a letter to JCC Chairman Hollifield. "It would establish a dangerous precedent," he added.

Regulatory—*Cont. from p. 56*

accruals will produce operating income which the P.U.C. would then consider excessive.

With respect to paragraph 2 of the order, this not only states that if companies continue to use normalized taxes, then these are to be credited henceforth to the tax reserve, but in addition an equivalent adjustment must be performed for 1960 or for an accounting period which already has been closed. However, leaving aside that detail, the transfer of the tax reserves to the depreciation reserves mentioned in paragraph 1 should seemingly have accomplished the 1960 adjustment, since the 1960 accruals have already been credited to the tax reserve. Unless the P.U.C. is totally confused, no further adjustment for 1960 is indicated.

Left unsaid by the P.U.C. is the course of action it proposes to pursue with respect to companies which have used the "flow through" method. Will these tax differentials which the P.U.C. erroneously calls "savings" and which are currently lodged in earned surplus be arbitrarily transferred to the depreciation reserve and thus cause a grave loss to the stockholders of the corporation? What precisely had the Commission in mind when it said that these savings " . . . carried to surplus represent amounts collected from the ratepayers in excess of the amounts allowed by the Commission in fixing rates?"

There may be substantial constitutional issues involved in this order not only to the utilities in California but to the regulated industry as a whole. It is understood that an appeal for a rehearing has been filed with the Commission.

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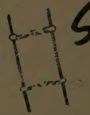

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ALL-ALUMINUM CONDUCTORS

(Continued from page 65)

jacking up every other structure approximately seven feet and stubbing. This will cost about $75,000. This method was employed, rather than re-sagging conductors, so that for a majority of the work two-line service could be maintained. Also, under favorable load and weather conditions, angle structures could be modified with the line dead.

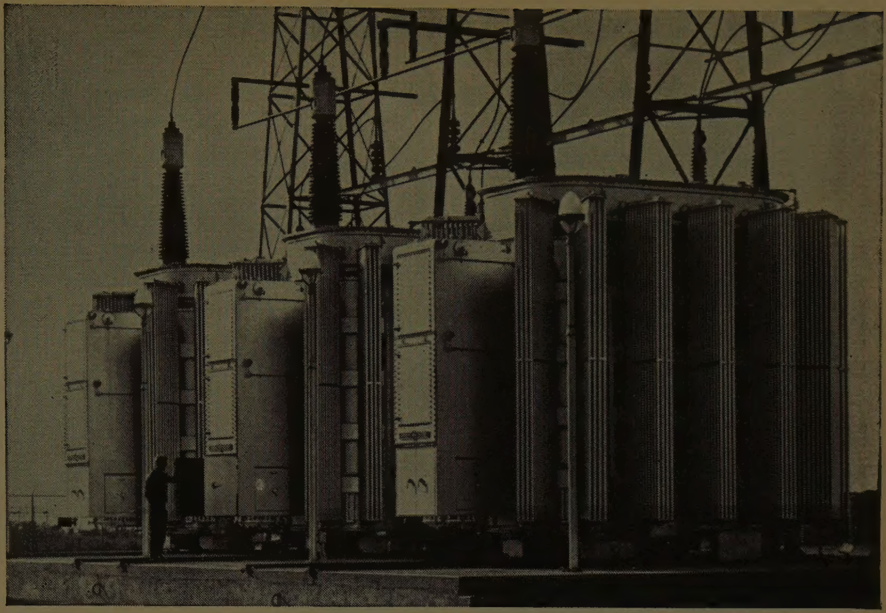
From our experiences, observations, and calculations in the use of all-aluminum, we have concluded:

1. Wire stringing tools must be selected with care after a thorough investigation of ones needed.
2. Caution must be exercised when making tension and loop splices to insure that the conductor is clean and that indentions are made with the proper tool.
3. Conductors should be installed at an elevation such that after 50 years of service, a 27-ft clearance at 60 F will be provided for 600-ft spans.
4. The Alcoa Graphic method of calculating sag is the best method for Gulf States Utilities Company.
5. Rate of creep of prestretched all-aluminum conductor is less than that of all-aluminum conductor that has not been prestretched.
6. Inaccuracies in sagging all-aluminum conductor because of such factors as conductor temperature, wind on conductor, friction of sheaves, etc., make sag comparisons very difficult.
7. All-aluminum conductors in large sizes will perform satisfactorily in the Light Loading District on 600-ft spans.

References

(1) Based on premise that idle conductor can reach 60° C in peak summer period. This limits rise to 30° C as conductor starts the anneal at about 100° C. Crosswind velocity 2 ft/sec assumed. Data taken from Burndy Engr. Co. Catalog 50, 2nd Ed. Tables 37 and 40.

(2) Experience with H-frame structures supporting 1,033,500-cm aluminum conductors during Hurricane Audrey, by N. C. Spencer, Southeastern Electric Exchange—April, 1958.



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2. **Film Thickness.** When repeated coats of paint build up on a transformer they tend to act as a blanket and hold the heat in. With Subox paints, *fewer coats are needed* and internal heat is more efficiently dissipated.
3. **Film Structure.** Aluminum-containing paints are often desired because they reflect sunlight; however, in conventional paints of this type the aluminum flakes overlap and leaf together to form an insulating barrier. In our Subalox paints, the polished aluminum flakes are non-leafing and do not overlap. Therefore, they promote both reflection and better radiation.
4. **Long Life.** The paint on a transformer is subject to wide temperature changes. *All Subox paints contain suboxide of lead.* This unique pigment remains chemically active even after drying; builds a tough, fibrous film that maintains flexibility and does not crack, chip, peel or blister even under the most punishing conditions.

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CALENDAR OF EVENTS

June 11-14 — ASME Summer Annual Meeting, Statler Hilton Hotel, Los Angeles, Calif.

June 11-13—Wisconsin Utilities Association, Accounting Section Conference, Dell View Hotel, Lake Delton, Wis.

June 13-14—National Safety Council, Public Utilities Section, Executive Committee, Laurentien Hotel, Montreal, Quebec, Can.

June 18-23 — AIEE Summer General Meeting, Cornell University, Ithaca, N. Y.

June 21-23 — National Committee on Utility Radios, The Nationwide Inn, Columbus, Ohio.

June 22-23 — EEI Residential Electric Heating & Air Conditioning Committee, Williamsburg, Va.

June 25-28 — 54th Annual Meeting, American Society of Agricultural Engineers, Iowa State University, Ames, Iowa.

June 26-28—American Society of Heating, Refrigerating and Air Conditioning Engineers Annual Meeting, Denver, Colo.

June 28-30—American Institute of Electrical Engineers, Instrument Society of America, American Institute of Chemical Engineers, American Society of Mechanical Engineers, Institute of Radio Engineers, Second Joint Automatic Control Conference, University of Colorado, Boulder, Colo.

June 28-30—NRECA Board of Directors Meeting, NRECA Building, Washington, D. C.

July 18-20 — Western Plant Maintenance & Engineering Show, Pan Pacific Auditorium, Los Angeles, Calif.

July 25-Aug. 10—1961 Chicago International Trade Fair, McCormick Place, Chicago, Ill.

Aug. 23-25 — AIEE Pacific General Meeting, Hotel Utah, Salt Lake City, Utah.

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